The use of gesture by young children and their teachers: a classroom based study of gestural behaviours in grouped tasks

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Abstract: Background: It is not currently known how Year 1 Primary school pupils and their teachers use activity-related-gestures and targeting, during group-based task-activity in a working classroom.

Aim: To explore this context using two teacher 'settings': 'teacher-out-of-the-group' (TOG) and 'teacher-in-the-group' (TIG), informed by an ecological, affordances-based, psychological perspective.

Sample: Twenty-five observations of pupil groups (12 TOG, 13 TIG), involving two schools, four teachers and 49 pupils, working in groups of up to six pupils.

Method: Non-video-based, systematic, participant observation in working classrooms.

Results: No statistical differences were apparent when girls' and boys' mean use of particular categories of gesture, targeting and task-activity were compared (underlying variability between participants may have influenced this lack of difference). Significant differences with their teachers were apparent. However, within and between settings, and within task-groups, some evidence of subtle differences between girls' and boys' overall gesture-use, targeting and task-activity profiles were identified. Extensive differences with their teachers were also apparent. Correlation analysis revealed that girls and boys showed limited and different associations in the two settings. Case studies revealed that a teacher, when part of a group, became the principal target for gestural activity, dominating pupil gestural and targeting activity. Limited evidence suggested that Partnering could affect gestural activity and task-activity. Teachers overwhelmingly used speech, rather than gesture, for communicative purposes, particularly in the TIG setting. Pupils used more gesture than did teachers in both settings.

Conclusions: Teacher and pupil role, pupil gender, task-structure, using shared resources and, to some extent, partnering, are key factors relating to pupil and teacher gesture-use, targeting and task-activity. Arguably girls, boys and teachers bring different saliencies and expectations to the same group activities, as revealed in their gesture-use, targeting and task-activity. The implications for classroom practice, and gesture-in-action in the working classroom, are discussed.

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The work presented in this thesis is my own work.

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Chapter 1

Introduction to the Study

Chapter 1

1.1 Introduction

This chapter sets the scene for the study as a whole. It identifies its impetus (section 1.2.1), its focus (section 1.2.2), and then specifies the research questions it has investigated (1.2.3).

1.2 The Study

1.2.1 The impetus behind the Study

An infant school pupil smiles as she hands a pair of scissors to a boy opposite her. He smiles broadly, nods his head and starts cutting. A boy looks around a group of his peers as he tries to explain the answer to a question. He pauses, using his hands to indicate the size and location of a piece of equipment, without mentioning these features in what he says and a girl to his right intervenes and carries on the explanation, referring to the object he had gestured about. A teacher working with a group of pupils raises her eyebrows in the direction of a boy who is nudging his friend as she is explaining a task. He stops nudging his friend and looks at her as she continues talking.

In each of these situations communication was occurring. But more than speech was being used - gestures, involving facial expressions, postural changes, body movements, limb movements and changes in intonation and emphasis in what was being said, were apparent (McNeil, 1985; 1992).

Perception of the gestural activity that had occurred, cognition about its occurrence and the processing of that experience and action associated with it, and deriving from it, underlay each participant's experience in each example.

In the examples above gesture carried the full message, as in the first example, or informed a message that was spoken, by giving a visual representation of the object in question, as in the second example. Further, again in the second example, an intonational gesture, a pause, offered a way into the boy's account so that the girl could offer her help and explanation. The third example suggested that gesture was being used to direct behaviour without interrupting communication of information by speech: two different intentional activities were evidenced using different specific modes of communication. Gesture was working in different ways in each example.

The gestural element may not have been thought about. It may have appeared without explicit intention. Its meaning might be queried, but it produced a response. This seemed to be consistent within the context in which it occurred, and apparently had meaning for others. It was, in each example, *understood* by those involved.

The three exchanges described above were observed during initial field observations of working classrooms in the closing months of 1999 as the author worked on data gathering for a larger project[1]. Pondering these exchanges led to the question of "what was known about verbal and gestural communication in the primary school classroom?" A preliminary review of the literature revealed at once that spoken language in the classroom had been, and continues to be, much studied. Gestural communication, however, had been little investigated, particularly in naturalistic settings. Where it had been examined, the 5 - 6 year age group (corresponding to Year 1 in English primary schools - the first year of compulsory schooling), had been little investigated.

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[1] The CASE @ KS1 Project (Adey, Robertson and Venville, 2002).

It was apparent from being in working classrooms that gesture was being actively used by both pupils and teacher. Some of this gestural activity - apparent as movements or changes in a person's actions and behaviour, may have been an expression of an intention to act, as for example when leaning forward to choose a particular crayon, or pointing to a particular child. It may have been intended to be directly, and overtly, communicative in nature. Alternatively, the observable activity may have been self-directed and not intended to communicate something to another. Equally it may have been 'other' directed as, for example, when one pupil touched another pupil on the arm. The observed activity may have been behavioural, rather than gestural in the sense just suggested, when, for example, a pupil briefly drummed their hands on a table. Some of these forms of activity or behaviour might have had a communicative purpose, others not. Some might have had an unintended communicative potential, when, for example the activity was observed by others as a result of proximity to the actions in question. This prompted the question of what, if any, role such actions and behaviours might have and the forms and purposes that those actions might reflect? From this arose an impetus to study gesture use, where it could be viewed as having a communicative purpose, 'intended' or not, in the primary classroom.

Watching teacher and pupil interactions during task activity it appeared that teachers were mainly using what children *said* to interpret what they meant. However, at times the teacher appeared to understand what a child was *trying* to say even though the child used no specific explanatory words. Gestures associated with activity, in the sense described here, were sometimes working with speech to convey meaning. Sometimes they were absent with speech carrying the communicative load. At other times gestures appeared to be the only form of communication taking place.

For the child communicating through any of the approaches just identified each mode offered a different window through which their understanding might be accessed. Pupils' present concerns and needs could be made

apparent to both peers and teacher. In so doing, they implicitly revealed their current level of understanding; what more they needed to know or do; what materials they might need to do it with, and how they might go about doing it.

These gestures might be targeted at themselves as when they solved a problem. They might be directed at fellow pupils. A piece of work might be held up and shown to other pupils in the group, a pointing finger indicating some aspect of the work. Or they might be directed to the teacher - a hand being raised indicating a need for the teacher's help. Equally they might be directed at particular resources or objects, for example, when looking for a particular colour of crayon. They might also be targeted at people who were using resources, such as indicating a pair of scissors being used by another pupil. Each form of targeting would carry additional information about the purposes and possible meaning of the gestures concerned.

For both teacher and pupil interpersonal communication must lie at the heart of pedagogy for it mediates learning as an activity. But it also potentially informs the teacher's assessment of a child's progress. This might in turn influence how future work might be used to support that progress, constituting a form of ongoing assessment of understanding.

Both teachers and pupils use speech, gesture, and gesture-and-speech when engaged in task activity. Where the teacher is *not* sensitive to or actually informed by these various modes of communication, there could be a consequent underestimation of her pupils' current level of understanding – pupils' gestures might be revealing elements of their understanding that they could not, as yet, put into words. A lack of such sensitivity to pupils' gesture would thus offer the possibility of underestimating a child's current level of understanding. This could lead to inappropriate task allocation and less effective learning. This suggested that an understanding of pupils' gestural activity *in relation to their work* would be useful.

The lack of knowledge about this aspect of classroom communication, for this age group, was compounded by such research as was available being largely drawn from laboratory settings. These were far removed from the messy world of real and working classrooms. Such research has tended to be focused on speech linked interactions rather than the more general task related – and grouped - interactions apparent in the classroom.

1.2.2 The focus of the Study

In the absence of the most basic knowledge about how gesture was used and targeted, in the primary classroom setting, an exploratory study was needed. It might identify key variables influencing interactions involving gestures. Such variables might then form the basis for further investigations. Identifying aspects of gesture use and task setting would allow them to be brought to the attention of practising teachers so as to add to, and possibly inform, their classroom practice. It would also serve to identify issues that might affect the feasibility of focusing on gesture as a means of revealing understanding in a working classroom.

Section 1.2.1 suggested such a study would need to be informed by a theoretical perspective embracing perceptual, cognitive and action elements applicable to a working classroom. In such a view a classroom would be a complex community of mutual interactions, involving people and materials. This suggested an ecological perspective, in which the perception-action cycle involved in interactions between pupils and teachers would be informed by the opportunities particular task contexts offered for such interactions.

Within these task contexts, the materials involved could give clues, by the perceived nature of their functional properties as to how they might serve in completing the task. These 'affordances' for action (derived from Gibson's Theory of Affordances (1979/86)) would not only mediate the completion of

the task but inform interactions between participants. Such affordances would be characteristic of the environment relative to specific individuals: the same objects would have different affordances for particular individuals. This would be to the extent that each person had a different repertoire of possible acts in a particular context. The range of action open to one pupil being different to those of another pupil depending on what opportunities they each perceived for action in the task. In turn these would be different for a teacher; the pupil's need to 'do' the task offering different opportunities for action than the teacher supporting the completion of the same task.

This ecological view assumes an underlying and central mutuality of individual-task environment – if the pupils were not doing that particular task they might not produce those actions, gestures or patterns of targeting. A different task or the same task in a different environment would offer different affordances and thus different forms of gestural action. If the study was to be of use to practitioners it would need to have a high level of ecological validity: its tasks would need to be recognisably those of the setting; they would need to offer the affordances that those with experience of that setting could recognize and relate to.

Further reflection identified other aspects of the environment that is a Year 1 English primary classroom. Such a classroom follows, for example, a curriculum involving a range of core subjects – English, mathematics and science – and a range of other subjects. However, a more integrated approach than this would suggest obtains in practice. The curriculum context of the tasks which would act as contexts for gestural interaction needed to be considered. Science activities offered both a wide range of task contexts and types of materials to interact with. It also offered a context that could be informed by the author's background in science work. As a core subject it would be a recognisable activity context in any classroom and one that could be expected to occur in every classroom at some time.

Further insights into a potential methodology for the study were informed by observations like those already mentioned at the beginning of Section 1.2.1. It was noticed, for example, that the observed gestures did not usually involve just *one* gesture in isolation. Rather it was about a *group* of gestural actions, which, although resolvable into a number of specific gestures (such as a glance or hand movement), could be interpreted taken together, as an 'ensemble'. This suggested that *ensembles* of gestural activity should be focused upon.

Equally, all three examples reflected an issue of to whom or to what the gestures involved were targeted: in the first example, another pupil figured in each exchange; in the second, two types of targets, pupils and resources or materials, while in the third, a specific pupil was the target. These 'targetings', however, occurred as part of a particular sequence of activity, itself part of a larger *task* activity. Both targeting as part of the activity and the task itself, as part of the setting, might thus have been significant. Either or both might have altered the modes of communication necessary to exchange ideas and understandings.

The structure of the tasks *themselves* and the activities they involved might have imposed restrictions on gestural activity. They might also have permitted particular types or patterns of gestural activity. They could offer particular affordances for action. It therefore seemed apparent that targeting as well as gestural ensembles would need to be considered, as would the particular task-activity they were associated with.

Were there any prompts from what literature was available? A more detailed literature review (see Chapter 3) revealed that little was known about pupils' and teacher's gesture use in naturalistic group settings, or how it was targeted, for this age group (5-6 year olds); indeed Goldin-Meadow (2000), an active researcher in the field of gesture, offered a further impetus for the study when she noted that:

> '1) Gesture...by displaying, for all to see, the learner's newest and as yet undigested, thoughts...
>
> 2) Gesture might ...providing another representational format in addition to speech...' (p232)

Pertinently, Goldin-Meadow (ibid.p235) also emphasised a need to explore naturalistic settings in addition to experimental ones.

Pupils spent much of their table-based experience of the classroom environment 'grouped'. In this physical arrangement they might work on common tasks, but as individuals or with partners. Rather less frequently, they would work as a group with a common purpose in a cooperative or collaborative task.

Here another gap in the literature was apparent for the majority of research to date, even on adult use of gestures, had been in dyadic, often face-to-face interactions or 'conversations'. These might involve the exchange of stories or instructions. Other approaches involved the interpretation of video materials or cartoon films. In so doing the 'tasks' being used were removed from the reality of what constituted 'tasks' in everyday life. They were certainly ones far removed from those normally occurring in the classroom.

Crucially for the classroom setting, previous work seemed to downplay or ignore interaction with physical resources during an activity (and the targeting of gestures towards those resources). Pupil tasks in the primary school classroom often involve the use of diverse types of materials as an integral part of the task activity. In such tasks the targeting of materials and how people used materials would be relevant. From an ecological perspective interaction with materials constitutes an integral part of a person's relationship to, and with, their environment when undertaking a task.

In addition, the literature on adults revealed virtually no work in relation to groups and gestures. It seemed to be assumed that groups worked as a series of overlapping dyadic interactions. However, if three or more people were in a group the interactions between particular individuals - dyadic or otherwise - were likely to be available to all members of the group. This suggested that such groups would need to be analysed at the group level rather than the dyadic level. To the extent that the literature made reference to children, it followed similar approaches to that of the adult studies (reviewed by Goldin-Meadow, 2000).

Within such groupings in the observed classrooms the teacher had a range of roles - she might only occasionally work directly with a group or, on the other hand, might spend extended periods with the grouped pupils, effectively becoming a group member. She might be a source of additional and specific resources or a source of advice as she travelled around tables in her classroom and a referee of the groups' interactions. The affordances she offered to pupils would change according to her role and her activity in the classroom. Given the public nature of the classroom setting, interactions would be potentially available to all those in close proximity to them.

Pupils could be working on their own on different tasks; on their own on tasks common to all the pupils in the grouped setting or class; as a partnered pair (effectively a dyad) or in smaller groups with a common purpose. Even if working independently, however, they would usually share resources for the task on a *per table* basis - that is, pupils grouped around a particular table would take their resources such as glue, scissors, etc. from a common pool of resources placed by the teacher at the centre of the table. These different settings would each have their own affordances for gestural action associated with particular materials and for interactions with people *as they* interacted with the task materials.

This suggested that even when undertaking a particular task, an individual, would often need to interact with others in negotiating access to shared

resources (emphasising the potential importance of targeting materials mentioned earlier). As Bany and Johnson noted (1964 p34), in a discussion about the nature of classroom groups which drew on the American literature, 'A number of people become a group when a condition exists in which each individual is affected by every other individual in the group'. The need to access and share resources as a result of the way a task had been organised by the teacher would be such a 'condition'. In the observed classrooms, no pupil worked in total isolation from each other. All would, at some level or in some form, have needed to interact with others and in the process share their intentions with each other. In this sense they were overtly part of a complex ecosystem of interactions.

In this situation pupils would be 'grouped' in that they were in close proximity to each other. They would only form a 'group', however, through the need to interact for resources. Not having a common task purpose, as in a cooperative or collaborative task, their 'grouped' nature would be limited. Given this ambiguity around the meanings of 'group' and 'grouped', a new term 'group(ed)' was coined and is explained further in chapter 3.

At this stage, these reflections helped to specify key aspects of the intended study. First, given the perceptual, cognitive and action elements of gesture, there was a need to adopt an ecology influenced psychological perspective to provide a working framework for the study. This would allow the mutual nature of how people, materials and tasks, interacted in the classroom, to be considered. Second, the potential for interaction offered by the materials, structure and organisation of the tasks being undertaken (and the associated affordances for gestural activity) would need to be taken into account. Third, the physical deployment of participants in the activity, their relationship to the teacher and her availability as a resource might relate to the affordances for gestural activity available to the various participants. Fourth, a number of questions about such tasks were apparent. Which ensembles of gesture were used in the task exchanges, to whom or what were they targeted and did the

gestural activity produced relate, if at all, to the task activity occurring when they were made?

The group nature of the classroom environment gave rise to further issues. If interactions were between persons, what might happen if the persons available changed? Would the observed gesture ensembles have been different if, for example, the gender of the participants had been different?

Thinking further along such lines identified a need to consider participant gender as a possible factor. This also implied a question about whether the teacher would interact with boys and girls in the same way. Could there be a gendered element to the way participants in the classroom interacted with each other gesturally? To the extent that some pupils worked as partners, as in the first example, the issue of partnering, as an element of task structure, would also need to be considered. Partnering would offer different affordances for completing the task by a sharing of workload, for example, and this might be associated with different patterns of gestural interaction.

More generally, would pupils and teachers, having different roles in the classroom, use gesture in a different way? An affordance based view would suggest that they would. In addition, children and adults might be expected to have different levels of communicative experience (and thus different repertoires of communicative action expressed through gesture).

These considerations implied a view of a group activity as being affected - and thus in some sense made *different* - as a result of a variation in any of a number of group characteristics. A further aspect of being 'grouped' was therefore defined in terms of differences in group characteristics (chapters 2, 3 and 4).

It was apparent that gestural activity could be *noticed*: the examples given earlier (section 1.2.1) had all been *observed* after all, and seemed to be

interpretable from an observer's point of view, suggesting that an observational approach (itself consistent with an ecological perspective) might be used (chapter 3). An experimental approach, whilst contributing to existing literature, would not have necessarily informed the naturalistic setting of the working classroom in a way that might be immediately useful to the teachers in those classrooms.

1.2.3 The Study: Research questions

The account that follows focuses on gestural activity among Year 1 pupils, in an English local education authority, inner city, primary school setting. It adopts a psychological approach informed by an ecological perspective based on the work of Bronfenbrenner (1979; 1993; 1998). It is further influenced by Gibson's Theory of Affordances (1979/1986). It focuses on gesture associated with, and related to, actions involving other participants and task materials. This reflects the mediating effect of physical interaction with task materials integral to many classroom tasks in this setting.

Further the study reports observations that give an insight into the ways in which pupils, and pupils and their teachers, interacted with each other. These interactions were in the context of science based group activities. In some of the groups the teacher was only a visitor to the group. In other groups she was a member of the group and part of its task activity (Chapter 3). Gestural activity was examined at the group level, and focused on *ensembles* of gestural activity, their targeting and the task activities being undertaken at the time they were made.

Gesture, gesture targeting and task activity were examined in relation to various participant roles: pupils and teachers; girls and boy pupils; and partnered or non-partnered pupils. These different roles defined the 'different' nature of the groups being observed (Chapter 4). The paucity of existing

research focused on young pupils and their teachers *in a working classroom context*, in which grouped tasks were used, directed the study's aim of exploring the nature of gestural activity in this setting towards a focus on four research questions.

(1) What gesture patterns were used by pupils and teachers during task-activity in groups?

(2) To what or to whom were gestures directed in these groups?

(3) How did gesture-use relate to task-activity in these contexts?

(4) What implications did gesture-use have for teacher management and engagement with pupils as they learned in a group?

The next chapter develops the theoretical ideas underlying the present study by expanding on the ecological and affordance based perspectives already referred to in the current chapter. Chapter 3 explores the literature that has informed this study. Gesture (and targeting), pupil groupings and the nature of tasks are reviewed in turn. How this was investigated is described in chapter 4. The resulting data (chapter 5) and its analysis are discussed in chapter 6. This final chapter summarises and explores the theoretical import of the reported findings, their contribution to knowledge in the fields concerned and the limitations of the work overall. It also identifies implications for classroom practice, concluding with suggestions for future research.

Chapter 2

Underlying theoretical perspectives

Chapter 2

2.1 Introduction

Chapter 1 framed the current study's focus on gesture in small groups in terms of an ecological psychological perspective. It was also one that drew upon Gibson's notion of affordances in linking perception, cognition and action during interactions between people and people and objects over development. In this chapter this perspective is expanded upon, drawing into the discussion, pedagogical elements from the work of Piaget, Vygotsky and more broadly socio-cultural approaches.

Section 2.2 relates a child to its environment and introduces the concept of affordances. The following section (2.3) uses the idea of affordances to inform an understanding of face-to-face interactions in the classroom. The next section (2.4) discusses how shared understanding may arise in interactions through the accessing of affordances. How understanding might be exchanged between interactants based on an affordance perspective is explained in section 2.5. The specific additional affordances offered by observing the interactions occurring between other people in the same setting are indicated in section 2.6.The chapter closes with points relating to the additional affordances offered by having a learning context actively structured by the presence of a learning manager (section 2.7)

2.2 Theoretical contexts

2.2.1 Child-environment – Affordances

The children taking part in the current study had, at the time of observation, had some five to six years of developmental experience. In that period they would have encountered a succession of different environments. These would have included being babies and toddlers with their carers, with siblings and other relatives, 'strangers' in the street, with other adults and children. These may have been relatively 'informal' in the sense of not being structured for overtly educational purposes or more formally in playgroup or at nursery school.

Latterly they would have included the environment of their year 1 classroom and its pupils, teachers and other adults. These experiences would have involved interactions with people, with materials and with people using materials. These would have either been directed at them, involved them or occurred in their proximity. Throughout this succession of experiences the child will have perceived their immediate environment and what it offered for learning and sense making. Gibson (1979 / 86), in his Theory of Affordances suggested that the child was gaining knowledge of the *affordances* – the potential for action - available to it. The word 'affordance' was invented by Gibson and used in his 'Ecological Approach to Visual Perception' (1979 / 1986). The use of it here follows that of Edward Reed (1993) in suggesting that Gibson's theory sees the environment as something "… to be perceived, acted upon and known." (p45) and that particular environments offer particular affordances for behaviour which the child (in this context) perceives and acts on as a matter of intention. In Gibson's words:

> 'The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*…[it is meant to imply]…the complementarity of the animal and the environment.' [Gibson's italics] (Gibson, 1979 / 1986 p127).

Each event, person or object, encountered by the developing child would offer different affordances for learning. The ability to access the experiences of others, events and objects in this way emerges early in development (e.g. Trevarthen, 1979, pp321-347; Kaye, 1982). In the case of interactions with others it appears to involve an understanding of them as intentional and self directing agents. These 'others' are seen to act upon the world, upon objects in it and other people (Messer and Collis,1999, pp432-468).

These interactions take place in a variety of social contexts. Each context has its own affordances. Initially the interactions involve gestures and noise making. Social interactions, even at this early stage, allow a hearing baby access to the speech of her carer(s) (Karmiloff and Karmiloff-Smith, 2001 pp43-55; Goldin-Meadow, 2003 pp208-228). Subsequently, as speech and gesture are exchanged and language use develops, through contact with carers and others, gesture and sound making become gesture and speech; the latter apparently taking the greater communicative load as an individual progresses into adulthood (McNeil, 1995). Interactions are often directly or indirectly mediated by the intervention of others or, as Vygotsky put it, in the context of children's development: 'The path from object to child and from child to object passes through another person' (1978, p.30).They are collaborative in nature and constitute productive joint activity (as defined by Crook, 2000 p162). They involve mutual interactions (reflecting mutual relationships) where, "… one person pays attention to or participates in the activities of another" (Bronbrenfenner, 1979 p56). These may be mediated by the use of objects, which increasingly become tools for action, within the surrounding environment.

The particular context or setting in which interactions take place offer to both speaker and listener (or one inter-actant and another) different possibilities and additional affordances. These in part relate to their previous experience of communication. The context itself and what each knows about, and understands of, the other in that context may play a part. Equally, materials may mediate interactions or be the focus of individual or shared interactions.

2.2.2 Face-to-face in the classroom ecosystem

For a child in the classroom situational interactions also involve an understanding of the culture of the classroom itself: of how things are 'done' and when, how and to whom they are acceptably performed with. It is informed by the teachers' and others' expectations, as well as their own. For a particular activity, the affordances of the task itself and their previous experience of similar or related tasks are also relevant. These relate to, and key into, the 'common knowledge' of the classroom (Edwards and Mercer, 1987 p42-61), and its 'educational ground rules' (Ibid. p128-159). These form part of the ecology of the classroom as a learning environment. How children engage with the learning opportunities (the affordances) of such an environment as an immediate setting may be addressed through Bronfenbrenner's notion of development in the immediate setting:

> 'It is a first axiom of the ecological paradigm that development is an evolving function of person-environment interaction. It is a second axiom that, ultimately, this interaction must take place in the immediate, face-to-face setting in which the person exists, what I have referred to as the *microsystem.'* [Bronfenbrenner's italics]. (Bronfenbrenner, 1993 p10).

In practice communicative interaction with the affordances of others, in the sense of Bronfenbrenner's 'microsystem,' involves listening and observing others – 'face-to-face'. Bronfenbrenner later extended this definition of the microsystem to take account of individual's roles and relationships within it:

> ' [a microsystem as]...a pattern of activities, social roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical, social, and symbolic features that invite, permit, or inhibit engagement in sustained, progressively more complex interaction with, and activity in, the immediate environment.' (Bronfenbrenner, 1994 p1645).

Later still, the role of time and temporality was also incorporated into the definition (Bronfenbrenner and Morris, 1998 p995) as was an awareness of the reciprocal nature of such interactions (Bronfenbrenner, 2001 p6965). Such interactions between individuals also involve a common or joint focus (through a common task or context) and willingness on the part of a child both to respond to the interactions of others and to initiate interactions with others themselves (although this does not mean that such a setting has to be explicitly for this purpose (Rogoff, 1990 p17-18).

A structuring of interactions takes place as the interaction is actually occurring: it is in a real sense 'talk in interaction' (Schegloff, 1991) and, more broadly, gesture in interaction as the two are intimately interlinked (McNeil, 1985; 1992; 2000). This reciprocal interaction pattern itself has rules of organisation that reflect the participants' cultural, social and psychological histories. It also involves the particular conventions and affordances of the setting in which it takes place (e.g. in relation to young children's interactions with adults, Rogoff, 1990 pp151-170). It would not be surprising if the task carried out in such a setting also affected the pattern of such interactions. Working side by side on the same task, but independently, might offer different affordances to working collaboratively on a joint task.

Where pupils are working with their peers, a degree of commonality of experience might be anticipated. This would arise from their being at a similar developmental stage or level of experience. Where others who are older or are adults are involved affordance for learning might be greater. This would be because of their more advanced development and greater experience of 'others'. The mutual nature of such interactions might also be influenced by the different capacities for independent action each participant might possess. This would be afforded by differences in age and maturity.

2.2.3 Affordances, social interaction and shared understanding

For a particular activity a shared understanding would seem to be needed. This would be developed through a common focus of attention and a common goal; the notion of inter-subjectivity. This idea is important in Reed's re-interpretation (1993 p45-75) of the Gibsonian notion of affordances. He was specifically interested in the relationship between affordances and intentions reflecting decisions to use particular affordances and not others. In particular he highlighted how more than one person acting with another can establish joint intentions through accessing the affordances available to them from both the environment about them and their interaction with each other. This may both contribute to learning events, and arise from them, as meanings are developed. Interactions between individuals would thus involve a negotiation of each other's mental states as expressed through their actions, gestures and speech. This implies that individuals have strategies for influencing others and affecting their behaviours and that choices about which are to be used, and when, are made.

It was suggested earlier that young children engage in reciprocal interaction with others and objects in the environment in a diverse range of activities, motivated by a need to understand the world around them. This embodies an ecological perspective on the nature of interactional contexts (Bronfenbrenner, 1993; Crook, 2000 p162). These same paragraphs implicitly adopted a cultural and social perspective on how these understandings arose which may be characterised as a 'sociocultural' approach to learning. This is associated with the work of Wertsch (1985; 1991) and Mercer (1995). It draws on Vygotskian and Neo-Vygotskian approaches to the question of how humans learn through action and activity in a meaning laden social context. This approach locates social interaction, psychologically, in a cultural context, as being at the heart of cognitive development.

The work of Cole and Scribner (1974), Cole (1996) and Rogoff (1990) would emphasise the *cultural* aspect of context and interaction (where affordances for interaction, gestural and verbal, are mediated by culture specific factors). Here collaboration through activities accorded importance in particular settings give opportunity for socially mediated learning. Situated learning approaches, such as those of Lave and Wenger (1991), place an emphasis on the individual in a particular setting as being mutually constitutive, as agent and activity, in their immediate world. For the pupils in the current study this 'world' would be that of their classroom and the task group they were working in at the time. They participate in this 'world' by being part of communities of practice, initially on the periphery of that practice, but over time with greater centricity and expertise (their skills in working in a group develop over time as they work in groups more often and with different people). This perspective, in common with others that focus on situated cognition, such as Suchman (1987) and Resnick (1991), for example, suggest that learning involves an absorbing of cultural practices through supported or scaffolded participation in a variety of activities. These were informed by psychological aspects such as intentionality, motivation and cognition.

'Scaffolded' in the foregoing context is taken to mean that the learner is initially supported in their understanding of a particular aspect. As support is progressively withdrawn, the learner is expected to become more competent and confident over time. The aim being that the learner ultimately becomes independent. All these approaches chime with those of Vygotsky who saw mental development among humans as being grounded in both the presupposition of '…a specific social nature and a process by which children grow into the intellectual life of those around them' (1978 p.88).

This approach appears to stand in contrast to that of Piaget. He offered an adaptive and biologically underpinned view of human behaviour, and particularly mental development (e.g.1972). Piaget took the view that humans came into the world prepared for the development of a range of

underlying logico-deductive mental structures. These logical structures underpin the development and expression of fundamental mathematical and scientific concepts (grounded in logic). Piaget suggests that they develop as a result of interaction with the environment. Children are thus born as investigators approaching the environment through a process of active experimentation, observing and testing; meaning deriving from the re-organisation of experience ais represented in schemas relating to different aspects of the encountered world.

The social aspects of this process were barely considered by Piaget. More recent interpreters of his views, such as Doise and Mugny (1984), suggest that cognitive conflict may be enhanced in the social context. Cognitive conflict, a key Piagetian idea, focuses on the potential impact of a child's experiencing a mis-match between their own current thinking processes and schemas and those they meet in their interaction with the world. Doise and Mugny (1984) argue that this sense of difference may be enhanced in social settings as they come into conflict with the views, and thus understandings, of others. Cognitive conflict from a Piagetian perspective heralds the development of new thinking and thus development of the thinking process. As such, argument and disagreement with peers or others offers opportunities to extend current thinking and thus the development of mental structures and processes. As these interactions must be communicatively mediated, gesture, as an element of communication, may be significant.

As a result of cognitive conflict, the schemas within which the child currently thinks are disturbed by the different viewpoint offered by another, leading them to a re-equilibration in their thinking (Doise, 1990), a process normally inhibited by the child's existing egocentricity. On the one hand, then, from a Piagetian point of view, social interaction may simply aid cognitive development, while on the other hand, from a Vygotskian view (1978), it is helping to shape and develop the very pattern of internal cognition. As this development is occurring in a social and cultural context (children are

surrounded by interacting 'others' offering a diverse range of affordances) Vygotsky suggests that:

> 'Every function in the child's cultural development appears twice: first on the social level, and later, on the individual level; first between people (interpsychological) and then inside the child (intrapsychological)' (1978 p57).

It seems, then, that the two developmental perspectives offer a different view on the role of social interaction. The Vygotskian approach puts greater emphasis on the social context of development compared to that of Piaget. Development is an individual process for Piaget and one in which the environment, including its social components, is an influence upon development, but nothing more. The individual and the environment, including other humans, are separate and can be differentiated one from the other.

However, Vygotsky and the socioculturalists, take a different view. In common with Gibson, they saw the child and the contexts they were in as fused together and inseparable; fused together in particular cultural activities in, and through, which learning took place. Mind, for them, develops through reciprocal action on others and the objects around them. It is embedded within the cultural context it finds itself in, engaging, from a Gibsonian point of view, with the affordances offered by the events around it.

Where there were two units, in the Piagetian view (the child and the environment they explore), Vygotsky and the socioculturalists effectively propose one unit. Here participation in forms of social practices relates a child to the environment. For the pupils (and teacher) in the groups involved in the current study it is the interactions of members of the group with each other, mediated by common materials, that afford a minded understanding of the task being undertaken. Both the Piagetian and sociocultural approach emphasise the activity of the child in respect of learning and define what the environment means to the child (Miller, 2002, p373).

Changes in participation may lead to changes in cognition and thus development. Mind becomes not something bounded in the thinking of one individual, as in the Piagetian view. Rather it emerges through interaction with others being constituted as 'socially distributed' (Hutchins, 1991). Here, mind develops through social interaction. In this process joint exchanges, of partial and hitherto individually localised meanings, are pursued. Participants' understandings flow into each other coalescing in an agreed, but more extensive, meaning. The mind is thus unbounded and in particular aspects extends into, and embodies, the meanings experienced by other minds. From a Gibsonian perspective it is a mutual recognition of the affordances offered by each person and their current understandings. Learning, in respect of development, thus emerges from the exchange activity itself.

2.2.4 Exchanging understanding

Vygotsky specifically identifies a mechanism whereby the different experiences and knowledge levels of a more experienced member of a particular culture (and the affordances they offer) can facilitate this gradual extension of the process of meaning exchange, that of the Zone of Proximal Development (ZPD). For Vygotsky, the ZPD is defined as the distance between a child's 'actual developmental level as determined by independent problem solving' and the higher level of 'potential development as determined through problem solving under adult guidance or in collaboration with more capable peers' (1978, p.86). This implies that the help involved is in moving from where a child is in a particular context to where they could be if helped. This approach underlies the notion of scaffolding mentioned earlier, and reflects a progressive lessening of help as the child progresses. For Vygotsky:

> '…learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with

> people in his environment and in collaboration with his peers' (1978 p.90).

As has been suggested earlier this learning is mediated through communicative interaction involving speech and gesture. In addition, the use of other symbol systems (such as writing in later development) and objects, all of which constitute social artefacts, have a role (Cole, 1996; Tomasello, 1999 p.84-87). Such interactions offer affordances for subsequent action and are thus implicitly developmental. Bronbenfenner, from an ecological perspective, takes a similar view. He identifies two general kinds of such interactive processes:

> 'First, there are processes of social interaction between the developing person and one or more others, usually older, occasionally of the same age, and rarely younger…' (1993 p10).

He goes on to suggest a:

> '… second family of developmental processes… engagement in progressively more complex activities and tasks…' (1993 p11).

In this view, if social interaction supports development, then, presumably, more complex patterns of interaction, in larger groups and with more complex tasks, would support such development even further (Bronfenbrenner, 1994; 2001). This has as an implication that past affordances for learning – as experiences – are retained. Learning, from this perspective, is, in part, an accumulation of, and accessing of, recollections of previous learning activities and their affordances. These may occur consciously or not. Within these contexts, recollection of what was learnt, in what way and to what purpose, offers affordance for future action. This reflects a 'memory' of the affordances offered from that event. Selection from among these affordances in encountering a subsequent learning event would imply decision making on the part of the learner.

Development then, in Gibsonian terms, represents an increasing capacity to decide on the affordances to be used in particular situations. These embody

prior experience, as an activity process, and the meaning accumulated through those experiences. Adults and others in this context may also, through their greater experience, offer a second layer of affordances to the less experienced child. They can establish potential links between apparently disparate aspects of experience. Within the scaffolding metaphor, this is achieved through the use of prompts, suggestions and modelled procedures, in the case of the mother and child, 'building bridges' (Rogoff, 1990 p.8). A child's present understandings are extended through skill acquisition and strategy use. For Vygotsky:

> 'The zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state…The actual developmental level characterizes mental development retrospectively, while the zone of proximal development characterizes mental development prospectively.' (1978 p86-87).

While Vygotsky discusses this in terms of essentially dyadic interactions this thesis will suggest it may be extended to take in the multiple ZPDs in operation between different members of a group. In extending it to groups, the question of proximity becomes an issue. The larger the group the more distant from a particular interaction one might become.

2.2.5 Affordances: observing the interactions of others

Rogoff (1990) extends the ZPD idea usefully (and Bronfenbrenner's notion of 'face-to-faceness' 1993; 1998) by suggesting that such encounters in the ZPD *need not* be face-to-face; they can be learned or engaged with at a distance through observing others and the actions they take. Such activities need not be specifically pedagogical in intention. Here the activity itself has affordances which are accessible to the child through interaction at a distance *via observation*.

In particular, these interactions do not need to be verbally mediated. If they occur at a physical distance from the child, they may be mediated by gesture and distinct sequences of action. These can be later mimicked or reproduced by the child. These re-enactments may in the act of their reproduction offer access to the affordances of the original event. Tomasello (1999 p87-89) has suggested that mimicking is involved in children's development of gestures. These may be based on the observation of adults other than their primary carers. In the context of a pupil group it will be suggested later that pupils may do this when another member of the group is interacting with a more experienced other. In these circumstances they indirectly access the subject and affordances of their interaction.

Rogoff (1990) extends this notion further with her idea of 'guided participation' (ibid. p191) which involves joint sharing and collaboration in the process of solving problems, as they arise, in a *variety* of contexts. To this end she employs the metaphor of 'apprenticeship'. This emphasises the induction into culturally located learning processes through particular activities that is taking place. Successive exposure to working in a group – as experiences - induct pupils into *how to work* in a group irrespective of whether they have been formally told how they should interact in such a setting.

When pupils work in a classroom with their peers there is, it will be argued, a similar induction into local cultural practices. This not only involves the content of learning (knowledge, etc) but also strategies to be used in accessing and using it for particular tasks. It is argued that gestures-in-association-with-action draw attention to, and identify, such strategies.

For Piaget meaning making initially involves motor actions on physical objects becoming internalised over time and organised into schema upon which other processes can act - moving from one object and back coming to represent mental reversibility in a logical sense. For Vygotsky what is internalised is the *social* interaction, the process, not its specific

informational content, so, as Miller suggests (2002 p382), dialogue with others become internalised as dialogue with the self. This process does not, however, involve a simple copying of exterior experience (inter-mental activity) into interior activity (intra-mental) rather it is modified in the process, becoming, later on in development, the curtailed and personalised mode known as "inner speech" (Vygotsky, 1978).

Language and gestures as symbolic systems appear to have had different meanings for Piaget and Vygotsky. For the former they emerged after the development of cognition being only one expression of symbolic abilities emerging semiotically at the end of the sensorimotor and through the preoperational stages. For Vygotsky, in a social, communicative context, language and gesture gave the opportunity to extend cognitive potentials through being tools that could access forms of thinking that might otherwise be unavailable or inaccessible. Within this social context children had access to meanings that did not rely on words alone but incorporated the pragmatic, word–in–context affordances that a particular situation might offer.

Rogoff (1990) suggests that children restrict or 'constrain' what they retain from such social interaction in the process of 'appropriation' (1990 p193-197), although the extent of their taking-partness ("participation" in Hoogsteder's (1995) terms) is also important. It relates to the range of meanings they can access from their interaction as a result of their "mutual modelling" (Dillenbourg, 1999 p1-19). In Gibsonian terms they come to select affordances from those available to them.

Development is a dialectical interaction with experiences out of which the individual seeks resolution of the various conflicts and contradictions that each event experienced contains, conflict having a positive developmental role (cf. Piaget (1950/2001;1975/1985) and cognitive conflict, in equilibration, being a pre-requisite for general structural change and its role in conceptual change. With more experience, the child would be able to

distinguish these different elements allowing a more effective use of the affordances of conflict for learning.

2.2.6 The affordances of a manager

In a pupil grouped activity context (section 3.4) each successive meeting of the group for a different task offers different affordances for meaning making. This would be mediated through language and gesture but stimulated by conflict over points of view and held meanings. This situation might be made more effective were there to be a 'manager of these interactions' present (Rogoff, 1990 p20). This person could be a teacher (as used in the current study among the Teacher-in-group tasks) or a more experienced other (another pupil in a group or a partner). This would represent a Piagetian approach in that it reflects the potential conflict between a pupil's own views and those of others around them. In contrast, Vygotsky would emphasise the collaborative aspects of the group. Conflicts would be resolved by negotiation of ideas and sharing of understandings.

The presence of an adult would, however, as suggested earlier, be more likely to mean that interactions were less balanced in experience or knowledge compared to interactions between peers. Equally, although the level of knowledge among pupils as peers might be less, the affordance of a more equal contribution might be possible. The latter possibly allowing more co-construction than the former.

The preceding section has introduced ecological and Gibsonian perspectives to interpersonal interaction. Piagetian and Vygotskian insights have contributed to the discussion. With Gibson (1979 / 1986) and Reed (1993) it has been suggested that development involves detecting and engaging with the affordances of what is around us as we develop the intentional use of those affordances for our own motivated purposes. This is by its nature a socially mediated engagement with affordances. As pupils

participated in the groups that formed the focus of the current study, this development was continuing. The next chapter reviews gesture (and gesture-targeting), groups and tasks informed by the perspectives just described.

Chapter 3

Literature review

Chapter 3

3.1 Introduction

Chapter 2 described the underlying theoretical perspectives that have informed the current study. These also informed the literature review that follows. The three sections cover in turn, gesture and its targeting (section 3.2), groups (section 3.3) and tasks (section 3.4). Each is approached in a cross-disciplinary way, drawing on related literatures as needed.

Section 3.2 reviews the notion of gesture and its targets. It discusses how gesture has been defined. This is examined in terms of three approaches to the categorisation and observation of gesture and the types of classification that have resulted. The role of the immediate environment in mediating aspects of gesture use is then examined. Proximity-related-gestures (Proxemics) emerge as potentially significant when small groups, spatially in close proximity to each other, are considered. It is argued that the grouped setting is more demanding than that of dyadic interaction because of its greater ecological complexity. It is suggested that as more people are involved than in a dyad, more diverse affordances for interaction are available.

Section 3.3 focuses on classroom groups: their nature, various forms and characteristics. In so doing, it argues that a group is, in an ecological sense, a microsystem. In this microsystem participant roles, gender, the issue of partnering and the specific role of the teacher offer particular affordances for gestural interaction. The issue of interpersonal proximity, raised in section 3.2 of the review, is then returned to in the light of the teacher directed nature of pupil groupings. The specific issue of collaborative and non-collaborative groups is then explored: it is in this context that the term 'group(ed)', rather than 'group', is explained.

Section 3.4, focuses on 'task' as an interpersonal context, using three approaches, to develop different aspects of how it has been viewed in the current study. Task *purpose* and its various conceptualisations then inform a discussion of task *structure* and *content*. Each contributes to the microsystem nature of the task undertaken by a group. It is asserted that these three aspects - task purpose, structure and content –provide, and limit, the use of particular forms of gesture by permitting some forms of interaction and not others.

Section 3.5 concludes the chapter by summarising perceived gaps in current knowledge in the areas reviewed. It also identifies the areas in which the current study seeks to gain new knowledge.

3.2 Gesture

3.2.1 Defining 'Gesture'

What then are 'gestures' and what is known about them, firstly among adults and secondly among children? The Oxford Concise Dictionary (Pearsall, 2001 p595) defines 'gesture' (as a noun), in two related ways: The first is as '…a movement of part of the body, especially a hand or the head, to express an idea or meaning'. The second is as '...an action performed to convey one's feelings or intentions'. Reflecting on these two definitions, it is arguable that gesture is a form of change that is apparent through an *alteration* in the appearance, position or activity of a part; of multiple parts or of the whole *body,* of a person. Further, it is a change that is brought about *intentionally* and for an *expressive purpose* associated in some way with the communication of ideas, meaning or feelings through the *action* of a person's body or its parts. Nowhere in the definition is there a notion of where the gesture concerned is 'going'. It is produced, it signals in some way, but what and to whom is not specified. If targeting of a gesture is part

of the intentional nature of gesturing as an activity, these two interpretations appear to fall short of representing gesture in its totality.

Adam Kendon, a noted researcher in the field of gesture (Kendon, 1982), criticizes these dictionary definitions because, he argues, they could encompass almost any human activity, which could then be construed as a 'gesture' (1987 p66). Kendon further characterises the notion of gesture by suggesting that actions that put persons in a position to communicate with each other and that involve spatial or positional changes are not themselves to be counted as gestural. Moving closer to a person to speak to them or turning to face a person prior to speaking are simply, in his view, the necessary steps to allow communication to take place. These he would make subordinate (ibid. p67) because they are not being done for their own sake but rather as scene setters allowing the interaction to occur.

The weakness of Kendon's view lies in the fact that the movements and actions concerned involve an *intention* to communicate; at what point in such a choice procedure can the gesture be said to begin or end? Choosing the person to be addressed, by moving closer or turning to face them, expresses a *targeting* of an intended communication rather than a mere positioning, which under other circumstances, could occur quite inadvertently. Kita (2003 p307-328) would take a different view suggesting that such orienting gestures should not be separated from gesture itself.

Kendon (1987) further excludes 'practical actions' (such as smoking, eating and drinking) from having a gestural role but admits that suitably embellished they can *take on* a gestural significance. His own early research offers some further clues to his position (Kendon, 1978). Having shown a sample of 20 Caucasian people a short film of a man giving a speech (the man was a member of the Enga people, of the western highlands of Papua New Guinea), he asked his participants, who had seen the film without a sound track, to describe the movements they had seen and, from their description, the extent to which they could identify the meaning the man was

making. The results suggested that all the participants were able to identify movements that were clearly intentional, conscious and intended as a part of the meaning he was trying to convey. They also identified movements that were not significant and rated as 'naturally occurring' and of no communicative importance.

One key criterion which his observers could agree on was that those actions taken to be meaningful had a distinct beginning and end, representing, respectively, a move away from existing action and a return to a prior action – what Kendon called an 'excursion'. For example:

> ' …for limb movements deliberately expressive movements were those in which the limb was lifted sharply away from the body and subsequently returned to the same position from which it started.' (1987 p69).

McNeil (1992), looking at the relationship between adults' speech and gestures has noted that adults routinely turn aside from gestural activity (presumably when targeting another person) when a subordinate clause occurs in speech, returning to the same gestural activity when they return to the main clause of what they are saying, something that children younger than twelve do not seem to do. However, Doherty-Sneddon and Kent (1996) report that 6-year-olds use deliberate gestures, involving the raising of hands above the level of a screen, in a similar exchange context. Thus, detection of a move away, the 'excursion', as Kendon describes it (1987), is also apparent in this context and accessible to children and adults.

However, such gestures need not be directed at another- they may be self directed or made in the absence of another capable of observing their production There is some evidence that speakers gesture more often when they can see the person being addressed (e.g. Cohen and Harrison, 1973, Rime, 1982; Bavelas et al 1992, Emmorey and Casey, 2001). People gesture when using the telephone (discussed in Goldin-Meadow, 2003, pps135-144) and it has been suggested that this may aid retrieval of items

from short term memory (e.g. Hadar and Butterworth, 1997), that is, gesturing can be for the benefit of the producer of gestures rather than necessarily for another person receiving those gestures. There is also some evidence that the type of gestures used, when a potential recipient is present or not, varies (Bavelas et al 1992). These differences take the form of fewer person directed gestures when another was absent while topic related gestures, referring to the substance of the exchange, remained at similar levels. Other researchers (Alibali, Heath and Myers, 2001) have suggested that when a 'listener' is physically present, speakers produce more semantically linked, representational gestures than when they are not present, while other gestures, such as those associated with speech rhythm (such as beats), remain unaffected.

Iverson and Goldin-Meadow, have observed (1998; 2001) that children and teens, blind from birth, nonetheless produce gestures when speaking (although they could never have seen the gesture production of others, or had those gestures inform their understanding of the messages being sent). Those same blind children also gestured when they knew the other person was blind, producing gesture at the same rate and in the same manner as participants who were not blind.

Kita (2000) has suggested that gesture may aid the 'packaging' of spatial or referential information which can then be produced as units of speech. This would take place whether or not another person was present, as its 'purpose' would be to facilitate the speaker's formulating the act of communicating ideas as speech. This would imply that if such gesturing was prevented the ease of making 'speech' would be reduced. The work of Rime et al, (1984) offers some evidence to support this view, in that it showed that adults conveyed imagery information, relating to a topic, with much less vividness when restrained from using gestures, than when they were allowed to gesticulate. Alibali et al (2001) showed a similar effect among young children doing conservation tasks. When allowed to gesture they produced accounts richer in perceptual related gestures than when

constrained (through the use of muffs fixed to the table). This occurred whether or not the account was being given to an experimenter or to an unseen fellow pupil. Pine et al, (2003; 2004) have begun to explore the same issue in their work on how speech and gesture reveal children's understanding of the balance task, and is the subject of ongoing research. Whether gesture helps memory function and cognitive processing, the recall of words or the packaging of spatial information, as suggested in preceding paragraphs, it is apparent that gesture may be used, by a producer of gesture, for their own benefit or that of others with whom they are communicating.

Returning to Kendon's investigations of what it is about actions that can have communicative potential, simply focusing on the '…manipulations of an object' (op. cit p70) were not regarded as expressive (although, they involved targeting and so were, in some sense, intentional). However, Kendon went on to argue that what his observers were doing was what people do in everyday life:

> '…they were attending to the behaviour of another in a highly differentiated way…what stood out for them…was what was most salient and worth reporting… those movements that shared certain features that identified them, for the observer, as deliberate and, in this case, intended as communicative.'(ibid. p70).

In this context then, Kendon implies that his observers had, without prior training (within the study as reported), a capacity to identify salience, in saying which gestures should be taken account of and how that might be recognised as communicative. Adults also seem to be able to take meaning from the observed gestural behaviour of children. Work by Goldin-Meadow, Wein and Chang (1992) suggested that adults *could* detect specific information from *video taped* recording of children's speech and gestures when observed carrying out a variety of tasks (the pupils were giving an explanation but targeted to their use of materials). In both contexts the observed task was set by the experimenter. The data offered to them for

analysis was the film shown to them about which they made comments. In the case of Kendon's experiment, observers had the opportunity to pause and stop the film. This allowed them to seek to identify boundaries as often as they wished, which would not be available to them in the original setting.

3.2.2 Intentional gestures?

The man making a speech referred to above was clearly intending to send a message to his audience. As this involved gestures these were presumably 'intended' as well – they were interpreted as such by his observers. The contested nature of the role of intention in gesture is apparent in the various ways that gesture has been categorised as *actions* (part of the definition given above).

Anderson (1991), for example, proposed a typology that sought to differentiate between 'intended actions' and those that might be 'incidental' (cf. Kendon, 1987 and chapter 1*)*. In this approach a particular action might be construed in a number of ways. It might be viewed as 'spontaneous'. A lack of intention (if intention is thought to involve premeditation) on the part of the sender might be assumed. It might be detected by the receiver by accident as a result of their proximity (in Anderson's terms an 'intuitive communication') - a pupil might wave their arm in the air, and a teacher going by, assuming it was a request for help, intervene. However, the pupil might simply have felt like waving her arm - and would have done so in the teacher's absence.

A second category in Anderson's system involved a 'symbolic message' which might be sent intentionally and experienced by the receiver but in an unconscious way (Anderson - an 'incidental communication') - a pupil raising her arm, this being noticed and interpreted as a request for help by the teacher who then asks if the pupil needs help. Equally, in a third category,

actions that convey, symbolically, something of the sender's current state may be 'sent' unintentionally (that is, they were not intended as messages *per se*) and yet may be attributed meaning by the receiver (Anderson - an 'informative communication') as when, for example, a child yawns and the receiver interprets this as tiredness. As this action is also a reflex action it could also be misconstrued at this level as well.

A fourth group involving 'interpretative' communication might involve messages that were spontaneous. These would not involve symbolic actions, would be received consciously and would have meaning attributed to them, such as when a child starts to cry, and the receiver interprets this as distress and moves to reassure the child.

Overall Anderson's analytical approach highlights the difficulty of when and under what circumstances we can confidently say that a particular action was intended or accidental. It does not refer to whether targeting was part of the intended action. This would further specify whether something was a gesture intended for others or not.

3.2.3 Directedness, the targeting of gestures and a message orientation

Other authors have focused on the issue of whom an action is *directed at* (thus making targeting an explicit part of the gesture notion). Researchers such as Motley (1990) and Bavelas (1990) take the view that 'communication' in this context should be restricted to activity that is *directed at another person* (other-directed behaviour). It should involve evidence of a cognition having been transformed into some form of coded and thus symbolic action. This has to be recognisable and capable of being interpreted by another, who is part of a two way interactive process. Participation in the interactive setting, according to this view, signals

availability for interaction and thus availability as a potential target for any gestures that might be sent. It says nothing explicit, however, about the mediating role of materials or of gestures used as part of materials linked action. Neither does it address the issue of gestures targeted at the self, (such as might be associated with private speech) or when a child taps themselves on the head with a pencil when deciding what to colour next - which may be interpreted by an observer as her thinking about her next action.

Burgoon (1980 p179-197; 1994 p229-285) focused instead on the *behaviours* themselves rather than on the sender or receiver status of the individuals concerned. This *message orientation* asks what behaviours can reasonably be regarded as communicative within a particular speech and gesture community. She suggests that non-verbal communication behaviours may be defined as:

> 'Those behaviours other than words themselves that form a socially shared coding system; that is, they are typically sent with intent, typically interpreted as intentional, used with regularity among members of a speech community, and have consensually recognizable interpretations.' (Burgoon,1994. p231).

In providing the definition above, Burgoon makes explicit linkages with the work of Wiener, Devoe, Rubinow, and Geller (1972) in their emphasis on the socially shared nature of the context (and as argued in section 2.2, with a socio-cultural view of interactions), and with Stamp and Knapp (1990). These latter authors suggest, through the notion of *interaction perspectives*, that both sender and receiver negotiate the meaning of, in this case, gestural exchanges, in a particular interactional setting and that the meaning involved emerges in the course of this interaction.

One implication of this view is that there must exist, or come into being, in such a context, mutually understandable and accessible meanings. These

are attributable to particular behaviours which are available to both participants at the moment of interaction.

A second implication of Burgoon's (1994) perspective is that such coded systems are rule bound or governed (this arises from the emphasis on 'regularity' and being 'consensually recognizable'). In this sense there might be an obvious parallel with spoken language with its own syntactic and semantic rules. This view effectively excludes behaviours that lack consistent meanings.

Burgoon's approach (ibid.), is in contrast to both McNeil (1992) and Goldin-Meadow (1998), who would argue that gesture conveys meaning mimetically (i.e. that it is representative in a narrative sense in a particular context) and idiosyncratically (that is that, in the same context, it is an individually produced gesture of flexible form and manifestation) through continuously varying forms (p29). Both these authors would appear to concur with Burgoon in recognizing that gestural meanings are context dependent. McNeil (1992 p41) refers to the observation that the same entity-related gesture in different contexts appears to have different meanings. Goldin-Meadow (1998 p30) refers to very young children's use of deictic gestures (pointing and directional actions) at around 10 months of age. The young child holds an object up to another person to draw their attention to the object. It draws its meaning from the object indicated rather than through any representational value.

However, other forms of gesture, such as iconic gestures (gestures involving movements or actions in space to represent or act out meaning associated with, or co-occurring with, a particular word or words), are less context dependent. They embody features or characteristics of the referred object, such as flapping hands to represent the flapping of a birds wings (Goldin-Meadow, 1998 p30). The context dependence of a gesture depends on the type of gesture involved, the age at which it is occurring and the context in which it is occurring.

Goodwyn and Acredolo (1998) appear to argue for a third group of gestures which they call *symbolic gestures* (as they appear to attain the same status as symbolic words) which are consistent in form and used to label multiple exemplars of a concept (p62). These symbolic gestures (also known as representational gestures; Capirci, Iverson, Pizzuto, and Volterra, 1996; Iverson, Capirci, and Caselli, 1994), involve those used by infants to label objects (panting for 'dog'; Goodwyn and Acredolo, 1998), to describe things (arms up for 'big'; ibid.) or to make requests (thumb to mouth to request a bottle; ibid.). These authors argue that symbolic gestures are very similar, if not virtually equivalent, to early words in several dimensions (op. cit. p70). Among adults, symbolic gestures have a parallel in emblematic gestures (see later: section 3.2.6), which can be understood as 'verbal phrases' and can occur without speech (McNeil, 1992) as do the symbolic gestures of Goodwyn and Acredolo (ibid.). Emblematic gestures may represent the adult form of symbolic gestures.

While Burgoon's definition, given above (1994), may hold for experienced members of a particular communicative community it begs a number of questions about those who have yet to enter that community by virtue of age. For such as these, a socially shared coding system cannot yet have emerged to the same extent, neither can the typicality of intention, interpretation and regularity that informs this definition have been fully established.

Burgoon's definition is useful, however, when considering the newborn and young infant in this context because it points to a crucial asymmetry in respect of the gestures between a developing child and their adult interactants: their carers and those around them. For the carers, the interpretations they place upon what they experience with their child (or the school teacher with their pupils in later years) are grounded in this socially shared coding system. But it is one that at this stage the infant (or later on, school pupil) may not yet share to the same extent as the adult(s) involved.

This asymmetry necessarily makes the issue of intention more difficult to access as is the negotiation of a common understanding for gestural meaning. Both sender and receiver, in such age asymmetrical interactions, may thus have both different competencies and different needs. From the Vygotskian view considered in section 2.2, however, such an imbalance might represent an opportunity for the younger person to have their ZPD extended, representing a positive learning context rather than a negative one. If it is the gesture itself that should be the focus, the meaning of that gesture still remains problematic.

3.2.4 Detecting gesture meanings and context

What *is* apparent, the issue of context to one side for a moment, is that there is an increasing body of work that suggests that both untrained adults and children, can detect meaning from gesture, in the absence of words, where the gesture appears to be conveying something not necessarily apparent in the accompanying speech (e.g. Alibali, Flevares & Goldin-Meadow, 1997; Kelly & Church, 1997; McNeil, Cassell & McCullough, 1994).

Indeed Goldin-Meadow and Sandhofer (1999) have suggested that listeners can read gesture in real 'live' situations where they have only one exposure to the gestural events being observed. That is, where they are part of the original interactional context. Interestingly for the present study, there is some work that suggests that teachers, notwithstanding their teaching experience and exposure to young children, are no better at reading pupils' gestural meaning than adults who had no teaching experience (Alibali, Flevares and Goldin-Meadow, 1997). As Goldin-Meadow notes (1998 p37) this seems surprising but may indicate that the integration of knowledge from both speech and gesture, as communicative modalities, is such "...a

fundamental skill that it is a basic feature of human communicative competence even in childhood."

Returning to the issue of context, Birdwhistell (1970 p173-227), writing from a linguistics influenced, anthropological perspective (that of kinesics), in contrast to Kendon's view, would argue that context was crucial to analysing and interpreting what he would call 'body motion' (ibid.). In a sense, Wiener, et al (1972), in their account, echo this concern whilst emphasising the *social* aspect of the context. In fact Birdwhistell asserts that there are two key points that should inform any investigation of body movement:

> '... (1) ...no body movement or expression is without meaning in the context in which it appears. (2) ... body posture, movement, and facial expression are patterned and, thus, subject to systematic analysis'. (op. cit. p183).

This view is clearly consonant with an ecological perspective, as it links gesture (as body actions) explicitly to the context, and thus the setting (environment), in which it occurs. Kendon and others (e.g. Argyle, 1988; McNeill, 1992); would agree that gesture (or body movement, in Birdwhistell's case) is open to 'systematic analysis'. But McNeil (2000), would emphasise the need to examine the setting in which such activity was taking place. As we shall see, the classroom, as a *setting* in which gestural action takes place, has particular features that make it distinctive as an *interactional* space (Rogers & Kutnick, 1990; Neill, 1991; Goldin-Meadow, 2000). The more so when pupil groupings are taken into account as a specific aspect of that setting (Bany & Johnson, 1964; Howe, 1997).

Birdwhistell (1970 p183-184) suggests, further, that a number of points follow from the two made earlier. The first is that, in his terms, body motions also relate to, and should be considered as a function of, the social system to which the group belongs (indicating a further parallel with the group as a microsystem). He further asserts that such activity, being literally visible to, and thus available to, all participants, can influence the behaviours of all

group members. Being so available to group members they should also be available to an observer for systematic investigation. However, he cautions that any meanings developed from such observations should be thought of as being functions of both the behaviours observed and *how* they were observed. This is further qualified by an acknowledgement that:

> '...the special life experience of any individual will contribute idiosyncratic elements to his kinesic system, but the individual or symptomatic quality of these elements can only be assessed following the analysis of the larger system of which he is a part.' (op. cit. p184).

What then are the *symptoms*, so to speak, of a gesture? It would seem that, although gestures are produced by individuals, they occur in a social and interactional context. This may itself inform or contribute to their meaning and thus interpretation, by offering affordances lacking in a solitary context. Individual gestures, from this view, involve behaviours manifest as body actions of varying forms, of varying longevity and persistence and may be made by any part, parts or the whole, of a person's body. They represent personal activity which is identifiable by other people (whether or not they were the intended target) as they experience them in particular contexts. They appear to have a communicative purpose and meaning.

Furthermore gestures may be identified as actions that depart, in a noticeable way, from previous actions. They thus represent changes in action or state. Their significance may stem from the context and the personnel among which they occur. Further, although they represent change, the change is bounded and can be described. It may, nonetheless, involve a series of smaller or intermediate stages some of which, it is assumed, are pre-intentional. These gestures, or their intermediate stages, may be made without the actor's conscious decision to produce them. Thus the person producing the action may not be able, subsequently, to explain when or why they decided to produce a particular action (or explain its

particular meaning). They may not even agree that it was actually produced by them in the first place.

In addition, beyond the accumulated experiences acquired through being a member of a particular communicative community, no additional training seems to be needed to be able to recognise and interpret the implications of particular gestures. Overall gesture, delineated in these ways and being part of a communicative act, is in some way associated with, linked to or informs, speech, this being the most obvious form of communicative action and interaction between people (recall that Kendon's observers were observing a 'speech').

'Gesture' as defined above raises a number of issues for the present study. The setting in which gesture is being used has already been specified as involving group(ed) pupils and their teacher (the microsystem of the grouped task). The same definition of the microsystem (Chapter 2) emphasised the face-to-faceness of interactions and the significance of the symbolic - and thus gestural - elements of such interactions (Bronfenbrenner 1994). Here, whether through a commonality of task or proximity and the need to share resources, interaction is permitted and may be expected to occur. This may be through speech alone, speech and gesture together or gesture alone. It is also a context in which participants have different levels of communicative - and thus we might suppose, gestural - experience as a result of their different *ages.* This communicative asymmetry may also reflect a cognitive asymmetry as, for example, the child may be more likely to have more implicitly held knowledge, and less explicitly held knowledge, than an adult might have in the interactional contexts in question.

3.2.5 Gesture as defined in the present study

The definition employed in the current study has been based on that of Burgoon (1994 p231) quoted earlier. However, it has been modified to take account of context, communicative experience, targeting and the situated task of interpreting gestural meaning in the original context in which it occurred. Thus gestures are defined as:

'Those action based behaviours, other than words themselves that form a socially shared coding system which is accessed throughout development and experience. Gestures are typically produced and targeted with intent, part of which specifies the target of the produced message. These are discernable and typically interpreted as intentional, used with regularity among members of a gesture-speech community, and have consensually recognizable interpretations, that are context related'.

It is worth noting at this point that targeting and its nature has been curiously little discussed in the literature on gesture. This may reflect the largely dyadic nature of the studies referred to, where the question of who was being targeted was restricted by the number of people involved (and may be assumed to have been obvious). The studies referred to earlier, often examined gesture in relation to speech. The physical materials involved in the task (if they *were* involved) did not figure as, or were not regarded as being, targets of gestural activity. This lack of reference to targeting of materials explains its absence in the current review.

In a grouped context, however, targeting, whether to people, materials or people using materials, takes on an additional significance. It may act as an indicator of the way gestural activity is distributed within a group. As such it may also act as a marker for the nature and extent of social interactions between group members, between partners and between pupils and

teachers. Gesture as defined above can clearly take many forms. These need to be organised in a systematic way if they are to be used to organise and analyse the gestures to be observed in the classroom groups of the current study.

3.2.6 Sorting out types of gestures

Argyle (1988) identifies a range of non-verbal communication 'channels' which are available to both children and adults alike. These include hand gestures, eye gaze, facial expressions, and various forms of touch, changes in posture or spatial behaviour. They also include a person's physical appearance, the non-vocal (that is speech) noises they make and the smells that they produce.

However, for the purposes of the current study a narrower range of 'channels' will be considered, consonant with the definition given in section 3.3.5. So, physical appearance and smell are excluded from current consideration, not being 'action-based behaviours'. The remaining non-verbal behaviours *are* action-based and involve some form of movement. They also represent movements away from or towards some pre-existing gestural state (cf. Kendon's 'excursions').

In gestural terms these *kinesic* gestures include all forms of body movement, whether of the whole body or its parts, and treat physical contact (*haptic* gestures) and interpersonal space and distance (*proxemics*) as related but distinct categories of gestures. Vocalisations (*vocalics*) are associated with kinesics as they involve movement of body parts including the mouth and tongue but are normally treated as a distinct group of activities. As movements are visible to observers they are sometimes referred to as visual codes, vocalics being referred to as auditory gestures. It should be noted that although these different gestures are classed in various

ways they often co-occur. So for example, a girl may turn towards another pupil (kinesic), lean forward (kinesic), in so doing reduce the space between them (proxemic), and, extending her arm (kinesics), point at a crayon (deictic) that she wishes the second pupil to pass to her.

A number of systems have been developed to characterise gesture in its various forms. One such, in the context of kinesic gestures, reflected a structuralist approach due to Birdwhistell (1955; 1970) who based his account of *kinesic* (involving movement) gesture on a linguistic-kinesic analogy, seeking structural relations between patterns of gesture in the same way that linguistics identifies structural relation patterns in language. While this had considerable descriptive (in the sense of being able to identify particular gestures in a systematic and reliable way) and relational value (how one gesture might be associated with another) it fell short of describing exactly what gestures were doing or being used for in specific contexts.

A second system, first suggested by Ekman and Friesen (1969), focused on what particular gestures might be doing, that is what their *function* in communication might be. Their system identified five categories of gestural activity. The first of these were called *emblems*, actions which could be substituted for words and have an explicit meaning, even out of context, such as a waved hand to indicate 'hello'. The second group were the *illustrators*, which were overt gesticulations which accompanied speech supporting the description being given rather than having a specific link to a particular word (the encircling of a car image accompanied by pointing, might be an example of this type of gesture[1]). Such gestures serve to hold the listener's attention or moderate the flow of the conversation they accompany. Within this category a further eight classes of action were identified:

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[1] It will be apparent that such a gesture could also be construed as representing or containing elements of an ideographic, deictic or spatial type of gesture. They may also be pictographic. The classification of gestures when more than one element is considered (i.e. an *ensemble* is being categorised) is clearly problematic (See chapter 4).

- *Batons* - placed an emphasis on a phrase, word or section of the speech;
- *Ideographs* - delineated a trajectory or path of an action or thought;
- *Deictic movements* - referred to an object or person (through pointing for example);
- *Spatial movements* - indicated a spatial relationship between objects, persons or elements within the narrative being given;
- *Kinetographs* - literally embodied a body action of the whole or part of the body;
- *Pictographs* - sketched or mapped out by their creation of a visual image in space, a particular referent (that which was being referred to);
- *Rhythmic movements* - depicted the timing, tempo or rhythm of an event or action;
- *Emblematic movements* - where an action repeated or substituted for a word or phrase.

The third group of gestural activity, the *regulators,* maintained and regulated turn taking between interactants. The fourth group specified emotions revealed through *affect displays.* It is in this area that there was, and remains, a debate about the universality of facial expressions and the extent to which they are culture bound.

The final category in their system (ibid.) reflected physical and psychological needs or desires. These were classed as *adaptor* gestures, representing stress related activities such as thumb sucking or pencil tapping, which would often involve interaction with specific objects. This object related group formed a sub-group of this category system: the *object-adaptors*. The other two sub-groups were *self-adaptors*, such as arm scratching or nose picking and *alter-directed adaptors*, when, for example, a body action was performed that distanced or protected a person from another, such as

when arms are folded across the chest (this was not a proxemic change as mentioned earlier – the distancing was implied by the interposing of a body part as a barrier between the persons involved).

Together these categories provided a detailed way of classifying gesture use through their *apparent function*. They required an interpretation of purpose which, like the issue of alter-directed gestures referred to a moment ago, could be ambiguous without further specification of *why* a particular interpretation had been given. Categorisation was not simply descriptive but became interpretative.

More recently, Bavelas and colleagues (Bavelas, 1994; Bavelas, Chovil, Lawrie, and Wade, 1992) introduced a system that, along with Ekman and Friesen's approach (1969), has informed the work of the current study. Their approach focused more specifically on the gestures used in interactions and, in particular, those symbolic gestures that were involved in conversational type interactions or ones where conversation mediated the task being carried out. Within this view such gestures could be divided into two groups; those that were content related, the *topic* gestures, and those that structured and supported the interactive nature of the interaction, the *interactive* gestures. The former would include emblems and illustrators under Ekman and Friesen's scheme and the latter regulators. The current study has focused, in these terms, on the *interactive* ('regulator') gestures just referred to rather than *topic* ('emblems and illustrator') gestures as the focus of the study was on the use of gestures in task activity, rather than task content.

In addition, though interactive gestures would involve those that directed information to the person addressed, indicating shared knowledge or understanding (*delivery gestures*), it allowed *citing* or *back referencing* gestures (to contributions made by the addressee earlier in the exchange) to be considered. In addition, gestures seeking help to make a point or

externalise understanding (*seeking gestures*) could be embraced and lastly explicit *turn marking gestures*, such as pausing linked to glancing.

The setting of interest here, however, also involved interactions with materials. Such interactions would not need speech to be necessarily linked to particular gestural activity (it would not be necessary to say "I want a yellow crayon" – the pupil could just reach for it and grab it. There was therefore a need to use a category system that could include such movement based gestures, as sequences, but which could be counted independent of speech. Pupils' and teacher's gestural actions in this sense, as they engaged with the tasks at hand, were the focus of the study and not hand gestures in relation to speech. Speech was of interest but the focus was more on what might be exchanged, communicatively, in the absence of speech or associated with speech but not necessarily symbolically linked to speech. In this sense the current focus was different to that of some of the literature to be reviewed shortly which focuses on this specific issue (reviewed by Goldin-Meadow, 2000).

Although informed by these two systems of gesture classification, the approach described in Chapter 4 departs from both systems in focusing on being primarily descriptive of the gesture being observed, rather than interpretative at the classification stage. It pays particular attention to the gesture ensembles (groups of co-occurring gestures) observed independently from the specific activity itself; observing or speaking, for example, going on at the time. If gestures are to be of use at a distance, as suggested earlier, the speech element would not necessarily be available. To offer an affordance for another observer it would need to do so from its appearance rather than the speech associated with it.

3.2.7 Gesture and speech

McNeil, a major researcher in the field of gesture, advocates the view that children acquire not just a speech system but a speech–gesture system (McNeil, 1992 p295). He further argues that the nature and role of this linkage changes over time as iconic gestures (those that bear a semantic resemblance to the speech itself) and other more abstract gestures develop along different routes. These reflect their different relationships to language, so 'beats', a movement like marking musical time, used to place emphasis on an action or word, or the abstract pointing gestures and metaphoric gestures mentioned earlier, emerge later, than say, complex iconic or symbolic gestures, representing a particular action.

Before the age of one, children use gesture or language but not both. After this age, gesture and a single word may be combined, effectively generating a two-word utterance, at around eighteen months, with babbling and gesture production co-occurring at around two years of age (Karmiloff and Karmiloff-Smith, 2001 p56-85) This gives way, in turn, to the greater use of combined gestures, words and sound. At around 4-5 years of age, gesture and speech merge and work together with subsequent development serving to enhance spoken communication and the meanings that may be taken from such interactions (McNeil, 1992 p296, discussed in more detail, p295-328). Of interest here is the emergence of symbolic gesturing where the gestural action represents and often adds to the meaning of what is being said in speech. It appears, however, to emerge independently of supportive vocalisation. This type of gesture, what Goodwyn and Acredolo (1998) call symbolic gestures, relate to gestures that embody, in the form of a particular action, a particular and apparent meaning. Goodwyn and Acredolo (1998) give a number of examples drawn from their research, including the use of an index finger circling overhead for a fan and the raising of arms upwards to indicate big (p62). In fact these authors have suggested, following their own research that symbolic gesturing activity contributes to the development of spoken language.

These types of results are permitted by the video methodology that produced them. To link speech to gesture both would need to be recorded at the same time in a fully synchronised way – all the speech behaviour produced by the participants and all their gestural behaviours. This would be the case with video film where all of the activity from both modes of communication was present. It would also be true of time synchronised, but independently recorded, images and sounds from the same event.

However, in the present study direct observation by an observer was to be used. The environment to be studied was one in which video recording of the participant's activity, as they worked around a table, would not be accessible to a video camera given the state of video technology at the time the observations were made (see chapter 4: it was also an issue for the inter-rating reported in the same chapter). Here an intermittent observation pattern was to be used. This was brought about by the need to observe each participant in turn, as they worked in the group, in a systematic way. Participant gestural activity in a group was to be noted at regular intervals (for each participant, at an interval of 20 seconds) while their speech was being recorded continuously. Speech activity, prior to and immediately following a particular gestural observation, would be available. That of the gestural activity, prior to and following a speech act, would not. It would be unwarranted to make claims about the relationship between gesture and speech under these circumstances. It would be relevant, however, to note whether speech activity - as an activity - was occurring when a gestural observation was made (See chapter 4).The rest of this review, although mindful of the link between gesture and speech, therefore focuses on the gestural element (or 'channels') of communication relevant to the methodology of the present study.

3.2.8 Children and Facial expressions

Gesture-in-interaction has been studied – and taught - since Roman times. The contemporary approach to its study might be said to have begun with Efron 1941 (cited by McNeil, 2000 p8) and has used both coded direct observation and video based methodologies to try to develop an understanding of the meaning value of the events observed and how they might be negotiated during interaction (see Beattie 1983 p23-28 in respect of video and gaze tracking in conversation). Facial expressions (a form of kinesic gesture), as one form of gesture and their meaning, for example, have been studied in a variety of different ways. Research has explored this area in detail among adults and, to a much lesser extent, children.

Ekman, Friesen and Ellesworth (1982 a, b, c), proponents of the view that expressions and their emotional meaning are universal, reviewed the preceding thirty years' worth of quantitative studies of response to facial gestures and their associated emotional states and interpretation. They identified happiness, sadness, surprise, fear, anger, and disgust as being almost universally accessible across a wide range of cultures and settings.

Izard (1972) independently arrived at the same conclusion from her own studies. These concentrated mainly on adults. Where children's expressions were examined these too were found to be accessible (Ekman, Friesen and Ellesworth, 1972). Eibl-Eibesfeldt (1970), working from the perspective of ethology, reported a similar conclusion based on work with a variety of isolated cultures.

However, this emphasis on the emotional significance of facial expression has begun to give way in recent years to different perspectives. These attribute to gesture, communicative, expressive and mimetic purposes that, it is suggested, may be the remnants of an earlier preverbal communication system. Thus may not necessarily be linked to emotion (Mandler, 1997 pvii).

The notion of universality of expression is by no means broadly accepted. Russell and Fernandez-Dols (1997 p3-30) have been particularly critical of the evidential basis for such assertions. This was based on both methodological (the use of static, posed, photographs in artificial contexts, for example) and interpretative grounds. They suggest that an approach to the evidence for cross cultural recognition of gestural meaning, based on identifying what various studies have in common across the studies and across cultures, should be adopted. These same issues have been reviewed from a less partisan perspective by Van Brakel, 1994; Parkinson, 1995; Cornelius, 1996; Oatley and Jenkins, 1996.

Russell and Fernandez-Dols (ibid.) have also emphasised the contextual aspects of gesture (consistent with Birdwhistell as already noted and the ecological view informing the current study). They have advocated a more ecological approach, advocating studies based in naturalistic settings. The work of Provine (1997), for example, has suggested that particular gestures (smiling in this instance) were more common in overtly informal social settings than in formal non-social contexts (a group(ed) activity would be regarded as such a formal context). He further suggested that commonality of expression (as opposed to its uniqueness or rarity of use) was another dimension of how gesture is interpreted.

These qualifications may well also be true for other types of gesture. Broader aspects of gestural interaction, such as body posture and hand gestures, for example, particularly among children and adults have been studied by Blurton- Jones, 1973; Ekman e.g.1975, 1978 et seq ; Smith, 1979; 1983; Woolfolk and Brooks, 1983; Argyle, 1988; McNeil, 1992; 2000). These accounts reported a range of gesture *use* involving facial expressions, kinesic, deictic, and proxemic-haptic gestures, that might be called interactional, but which related to specific contexts. In the case of Blurton-Jones (ibid.), Smith (ibid.) and McNeil, (ibid.) there was a persistent concern for the need to question underlying assumptions. In each case concerns were expressed about the ecological validity of the laboratory

based studies they were reviewing and the problems of interpreting the meaning of gestural activity in particular contexts. This was particularly so given the overwhelming use of laboratory based studies as opposed to those in more natural settings.

At the time of Blurton-Jones' review (1973), gestural studies were still influenced by notions of display and its meanings, both from an anthropological and an ethnological perspective. He noted the use of posed photographs (op. cit. p278) to elucidate facial gesture meanings but was rightly critical of the non-systematic approaches used at the time. The few studies that were carried out systematically, such as that of Michael and Willis (1968) in their focus on facial gesture meaning *attributions* among 4-7 year old American children, were less conclusive than they might have been because of the use of vaguely defined categories, both of the gestures themselves, and their associated meanings.

A more potentially useful observation in the current context was made by McGrew (1972), who reported that the frequency and extent of smiling seemed to be related to the amount of interaction between individuals, so that the more interaction the greater the frequency and extent of smiling behaviours. Note here that a gesture (smiling) is being put into a particular type of activity – interpersonal interaction – but the specific context is lacking. This apparently assumes that the activity transcends the context. Ames (1949) reporting work on pre-school children noted more smiling when children approached teachers or other pupils in what he described as 'social approaches' and 'verbal approaches'. But again, in this context, it is not clear what these actually mean, as Blurton-Jones points out (1973, p 282).

3.2.9 Children's gaze

Smith (1983 p171-202), reviewing non-verbal behaviour referred also to the difficulties of identifying what exactly is meant by such behaviours and understanding what they mean to those who experience them. Like Blurton-Jones he cautioned against taking results at face value. He also identified the need to be cautious about the notion of cultural difference in respect to gesture and what this means in a classroom context. He noted that, prior to 1960, little gestural work had been done in a classroom context (Smith, 1983 p172). He suggested that since then such work as has been done has been characterised by the two category approach of Scherer and Ekman (1982). This focused on the gestural actions of the individual and on the nature of the interaction, rather than on issues of display. Again, in this view, the context in which these interactions were occurring appeared to have been put to one side

Smith (op. cit.), however, did pay attention to the environmental aspects of the classroom, for, as noted already, these may, directly or indirectly, influence observed gestural behaviour. In this context he concluded that there were no clear indications about the contributions of design or organisation of the environment but that, at the elementary school level, sound proofing and teacher activity among pupils may be significant. Where proxemic aspects were considered, however, he suggests that seating arrangements may well be significant (as have more recently, Hastings and Wood, 2002 p31-34), and that this has an effect on gaze activity through eye contact.

Eye contact involves, in a kinesic context, orientation to the object or person involved, either of the head or of the eyes, in relation to some spatial target. The making of eye contact emerges shortly after birth with an apparent fixation on the caregiver's eyes (Argyle and Cook, 1976; Roedell and Slaby, 1977), although Stechler and Latz (1966) suggest that this merely signals attention on the caregiver's face rather than a social messaging act. Infants

appear to be able to access information from adult gaze, direction (Bruner, 1983; Butterworth and Cochran, 1983), following adjustments of adult gaze after 4 months of age, with the accuracy of targeting developing at around one year of age (Bruner, 1987; Butterworth, 1987).

Joint attention can be facilitated by change in gaze direction and head turning, prompting a change in the direction of observer visual attention (Langton and Bruce, 1999). Similar effects are apparent, in even very young children (3 months old – Hood, Willen and Driver, 1998), although this was based on targeting to a screen rather than to real adults or people. Up to about 14 months of age, babies and infants will use turn shifts, gaze shifts and eye movement to follow the activity of their mother (e.g. Butterworth and Jarrett, 1991). When the child is older than this, attention to eye cues alone appears (Moore and Corkum, 1998).

The significance of joint attention may lie in its role in language ability development (Baldwin, 1991) and in detecting social cues in relation to encounters with objects (Baldwin and Moses, 1996) or people. It establishes, so it is argued, a joint communicative context, within which interaction mediated by language can develop. It may even inform the development of Theory of Mind- the processes whereby we make sense of our own mind and its activity and make inferences about the minds of others (Baron-Cohen and Cross, 1992).

Joint attention mediated by gaze may be supported by haptic (touching) interaction with the objects being focused on by the mother (e.g. Lempers, 1987).This may be linked to the mother making locally characteristic sounds and movements of the object (Bruner, 1983). Adults follow infants' gaze (e.g. Schaffer, 1984) with the possibility, according to Bakeman and Adamson, (1984), that this type of interaction socialises the meaning of objects in the particular parent-child environment.

In the classroom, however, arrangements that allow extended eye contact seem to be associated with more interaction between pupils and teachers (Smith, 1983 p174). He particularly refers to 'triangles of participation' in traditional classrooms when organised in rows, between the teacher and adjacent rows of pupils. These 'triangles' may be maintained and move about the classroom as the teacher changes position (e.g. Koneya, 1976). U –shaped arrangements of pupils and teachers also seem to encourage eye contact and interaction, particularly when the teacher is located in the open part of the 'U' shape formed by the pupils' desks (Sommer, 1969). Rubin (cited in Smith, 1983 p175) even suggested that there was a difference in outlook between more and less able students, the latter favouring closer proximity and more eye-contact with the teacher than the former. Koneya (1976) has referred to high and low participation areas of the classroom where interaction frequency may be increased or reduced as a result of relative proximities. Children's desire to be near teachers when interacting in a two-way pattern relates to interpersonal distance: as this increases there appears to be more uni-directional interaction than when participants are closer together (Brooks, Silvern and Wooten, 1978).

Shared eye gaze may also inform learning more directly. Otteson and Otteson (1980), for example, reported that children remembered more of the details of a story, narrated by their teacher, when the teacher punctuated the account with frequent gazes directed at the pupils. Equally gaze aversion (as the breaking of joint attention) can be used, by both adults and children to break off communication. Glenberg, Chroeder and Robertson (1998), reported that adults tended to avert gaze when asked difficult questions. Anecdotally, when asking pupils questions in class, some may signal not having the answer by turning or looking away (see also Doherty-Sneddon et al, 2002; Doherty-Sneddon, 2003, pps110-138).

Longbottom has also suggested (2001) that, in the context of 6 year olds (and thus relevant to the target population in the current study), the extent of gaze aversion (as a negative form of joint attention and common gaze)

increased noticeably from when children did not understand an arithmetical problem to a peak when they were just beginning to understand it. Gaze aversion declined again as they gained mastery of the problem in question. This may mean that gaze aversion can be used, by teachers, as an indicator of how a child's understanding is developing – it may give clues to the stage of learning the child has reached. It does not imply that that the aversion is necessarily a *negative* breaking of contact - it may be being used to free up cognitive resources for problem solving by restricting incoming perceptual information (to be discussed further in chapter 6).

This use of gestural behaviour to make judgements about the learning status of a pupil is broadly consistent with Goldin-Meadows' view that attention to gestural behaviour, in concert with speech behaviour, offers just such insights. Her focus, however, would include attending to mismatches between gesture and speech, signalling where specific learning has got to in its development (2003, pp39-54).

3.2.10 Children's deictic gestures

One of the earliest appearing and most used forms of kinesic gesturing is that of pointing (reviewed by Butterworth 2003). This form of *deictic* gesture, that is one that directs attention to something through the act of pointing, giving or showing, has been shown to develop in an ordered pattern over time alongside vocal development, starting during the first year of life (e.g. Capirci, Iverson, Pizzuto and Volterra 1986). Goodwyn and Acredolo (1998) suggest that such deictic gestures are ambiguous (whilst appropriate to the activity, Pechman and Deutsch, 1982) without further information about which particular object (the referent) is being indicated, given or shown. The gesture itself (the pointing finger for instance) does not of itself have a meaning, rather it is a prompt to follow an indicated trajectory to the referent. Its remaining ambiguity (there may be more than one possible referent in

that particular direction) is removed by the use of vocal content. The pointing action will usually have been preceded by the child glancing at the receiver of the gesture (Hannan, 1992).

Pointing in so far as it expresses interest or identification of an object or person, as the subject of the communication, is one of a number of symbolic gestures which relate to commenting upon and requesting particular actions. (Blake and Dolgoy,1993; Blake, McConnell, Horton and Bemson, 1992). Symbolic gestures develop through childhood undergoing a transition from body-part gestures which visually represent the appearance of an object related action to imagery-object gestures that include the actual physical process (such as holding) involved in a particular action (Boyatzis and Watson, 1993).

Over a similar period the use of iconic gestures, which embody some aspect of the physical world and may or may not accompany speech, also changes. In a sense, for younger children these gestures become part of a miming of the action of something because action expresses meaning as when the action of a cartoon's characters are explained by acting them out (McNeil, 1985). McNeil suggests that young children's gestures are initially self-centred, expressing what they are trying to communicate from their own perspective, a more detached perspective being apparent in older children and adults.

3.2.11 Children's haptic and proxemic gestures

Relationships between individuals may be expressed through touch (haptic gestures) and proximity. However, haptic interactions between teacher and pupils and pupils and peers seem to have been little investigated, although among younger children there is some evidence that children are sensitive to, and act upon, intimacy norms in haptic and proxemic interactions. This

awareness may be expressed in patterns of 'nervous', self touching when proximity changes exceed intimacy norms (Sousa-Poza and Rohrberg (1972), or, through the use of increased gaze avoidance : pre-school children would tend to return the stare of an adult, older children would not and would move away (Scheman and Lockard,1979). Crowding amongst 10 year olds can lead to negative effects, and increased stress, made manifest through poor behaviour; this effect being ameliorated when greater interpersonal distance was possible (Ailleo, Nicosia and Thompson, 1979). Contact at the end of a gesture (such as reaching for the face or skin) haptically confirms that a particular trajectory has been achieved. Hill and Smith (1984) have suggested that patterns of mother baby interaction set up a feedback cycle that reflects interlocking patterns of haptic interaction. They further suggest that this forms the basis of subsequent interaction, that is that touch marks the *beginning* of physical communication.

This might be evidenced in the exchange of materials between year one pupils in a classroom when, for example, one pupil draws the attention of another to the location of a particular resource, such as a crayon. This might be through the first pupil taking the crayon and touching the second pupil with it gently on the hand or arm, thereby announcing both the proximity of the resource and an intention to pass it on. Alternatively, the crayon in this example might be held up and pointed to and then passed to the second student. Touch and thus haptically associated gestures being involved in both instances.

Rogoff (1990) offered a slightly different, socio–cultural perspective on development, as noted earlier in giving an account of social interactions as involving bridge building activities often structured around modelling interactions or actual, physical, interactions (p65-85). These may or may not involve speech. If speech is used to convey the main message, hands (and faces) may convey physical aspects of the task, such as position, distance etc. that may be difficult to express simply in words. That is, the speech and manual components of the communication serve different but

complementary purposes (Goldin-Meadow and McNeil, 1999), with gesture being able to take over some functions, such as syntactic elements, when speech is not available (Goldin-Meadow, McNeil and Singleton, 1996). This has implications for understanding the evolutionary relationship between gesture and language use and, indeed, how both evolved (e.g. Corballis, 2002).

Culturally located 'appropriate' patterns of haptic interaction (associated with culture, or gender) appear to be quickly established in development (e.g. Hall, 1983 p5-27; Anderson and Sull, 1985), including closeness of approach to others (Aiello and Aiello, 1974). Interpersonal distances vary over the life course but the distance between carers and children when ambulatory increases with the age of the child (Sigelman and Adams, 1990) - classroom observation suggests that anxious pupils tend to stand closer to their teachers than happy pupils do.

Over the age range of the current study, and into adolescence, boys and girls engage in more same sex touching than mixed sex touching (e.g. Berman and Smith, 1984), but such data also identifies girls having more reciprocated touching interactions than boys and more overall contact than boys. This extends to touching of teachers; boys touching male teachers more than female teachers and girls touching female teachers more than male teachers (Perdue and Conner, 1978).

Distancing by an individual child, from those around them, by the use of physical separation can be seen in young children. Three year olds will sit close to their peers when working on an activity in which they are both involved, children of 5 to 7 years old will sit further apart (Lomranz, Shapira, Choresh and Gilat, 1975). However, distancing behaviour is related to a number of factors, changing with age (e.g. Lomranz et al, 1975), with degree of intimacy with the other person (e.g. Guardo and Meisals, 1971), with the sex of the other person (e.g. Berman and Smith, 1984), with different cultural subgroups (e.g. Aiello and Jones, 1971), ethnicity (Jones and Aiello,

1973), and the extent of friendly interactions between peers (King, 1966). Girls overall appear to manage these proxemic interactions more effectively and at an earlier age than boys (e.g. Altman, 1975), while both girls and boys become more aggressive when comfined in smaller spaces or higher densities (Loo, 1972). This may also relate, however, to developing notions of personal space and privacy (e.g. Wolfe and Laufer, 1974 p29-54).

Haptic and proxemic interactions appear to inform the strategies for action available for children of particular ages although the specific and other gestures used in these situations have not been reported. *Immediacy* is, in a sense, an affectional aspect of proximity and is variously taken to reflect the degree of intensity or directness between individuals (Mehrabian,1967; the 'attentiveness' between individuals, Mehrabian, 1981), their psychological closeness in communication (e.g. Anderson, 1979), and affective involvement (Burgoon and Hale, 1984). As these behaviours affect the degree of proximity between individuals they also relate to the extent that sensory information is available to the interactants upon which communicative judgements can be made. Haptic and proxemic behaviours *as* behaviours may serve to indicate relational aspects between interactants. With increasing distance apart, haptic and proxemic gestures become less possible while facial gestures may remain detectable. Equally, at a greater distance, facial gestures become unclear while kinesic gestures, such as arm waving, remain visible.

A number of typographies reflecting degrees of access by different individuals one to another have been proposed (e.g. Altman, 1975). The degree of personal control and autonomy over the immediate space around a person also appears to be a factor (Lyman and Scott, 1967), as does interpersonal distance (Hall, 1966), the notion of intimate spaces in non-intimate settings, such as the classroom (Heston and Garner, 1972, cited in Burgoon, Buller, and Woodall, 1996 p92), and the type of interaction activity taking place, e.g. standing (Altman and Vinsel, 1977).

Burgoon et al (1996 p.92) has summarised effective personal space, in terms of an *intimate* zone, (0-12 inches separation), a *normal* contact zone (1-7 feet of separation) and *formal* zone of separation at 7 feet or more. For 5-6 year olds, who are *required* by their teacher to be seated around tables of given sizes and thus interpersonal distances, altering distances between themselves and others would necessarily involve proxemic activity in the form of leaning, shifting of seats or lying along the edge of a table. As such they may take on significance that they might not have if the constraint of being seated for their activity was not a classroom 'rule'. Intimate distances might be established by whispering and close leaning together: for such interactants, the formal zone would be defined in part by the size of the table as the area in which they are working. For individual work, an intimate zone around a pupil's work might be demarcated by a protective encircling of that work with one arm. Although such an action might be presented as a strategy to prevent copying, it might also set a boundary between an intimate and a more public space.

It is worth noting that haptic and proxemic behaviours are particularly open to misunderstanding, not least because there are so many possible behaviours available and at any one time a number may be in play simultaneously. Cues which reinforce a particular perception: glaring, sudden movements towards a person involving a reduction in personal space and increased proximity might all lead to fear of an aggressive act in the offing. On the other hand, gestures that appear to contradict each other (smiling and moving a hand towards the face suddenly, coupled with a sudden reduction of personal space) can cause confusion and also concern (e.g. Burgoon, Buller, Hale and de Terck, 1984) - there are parallels here with the detection of a mis-match between speech and gesture to be discussed later.

For pupils sitting in a group, proximity, touch and facial gestures offer many affordances. Not least because among the age group in question (5-6 year

olds) close proximity is socially acceptable and intimacy, in the sense of 'being friends', something that pupils refer to a lot in their daily interactions.

3.2.12 Gestures and Teachers

Teacher use of kinesic gesture varies considerably, possibly as a result of personality – some teachers use pointing and symbolic gestures more than others (Roderick, 1973, cited in Smith, 1983 p177). This may influence pupils' perceptions of the nature of the classroom (Mehrabian, 1981). Neill (1991) has given an account of classroom non-verbal behaviour, focused mainly on the English secondary school classroom involving children older (11-19) than those in the current study (also see Neill and Caswell, 1993). It remains the single source on the subject in that context at the time of writing. Cultural background and cultural differences are apparent in gesture even in classroom contexts perhaps requiring teachers to be more sensitive to such variations (Wolfgang, 1979, 1979; Grove, 1976).

Teacher involvement in either a whole class or group setting is signalled by a tendency to lean forward to join the group (e.g. Keith, Tornatzky and Pettigrew, 1974) but this could be explained in terms of needing to be seen and then being able to be heard by the students involved. The same authors note the importance of gaze in establishing contact between teacher, pupils and their peers. Linked to smiling on the part of the teacher, a sense of warmth and approachability is engendered which may also promote a more positive working environment (Keith et al, 1974; Bayes, 1970, cited in Smith, 1983 p181).

More broadly, various researchers have investigated the interactional nature of classrooms, focusing on specific aspects of interaction, for example, mutual classroom influence as expressed through interaction (Doyle, 1977); movement through space associated with unspoken instructions (movement

as ensemble of kinesics gestures), where physical position in the room permits particular behaviour (Shultz and Florio, 1979, cited by Smith, 1983 p191) and the acceptability of particular behaviours in particular spatial contexts.

Woolfolk and Brooks (1983), in their review of literature in this area, queried whether teachers actively use gesture to tune into their pupils' current emotional and cognitive states. Whilst they acknowledge that gesture use is apparent in classrooms they also query whether pupils do the same for teachers. Equally, as these behaviours vary over time and in different contexts, they also ask how pupils interpret these variations in behaviour and more generally what role gesture plays in classroom management (see also Smith, 1979).

Unfortunately many of the small scale studies they cite (Woolfolk and Brooks, 1983) were laboratory based, used very few participants and, in some instances, used actors to take the part of pupils or teachers, raising serious issues of ecological validity in the findings produced. Very little of what is described in their review is classroom based, or indeed small group based, although they do identify proximity in one-to-one interactions as important (Woolfolk and Brooks, 1983). Female teachers in particular cultural settings (America in this instance) are viewed more positively, from a gestural standpoint, than men (Woolfolk, Woolfolk and Garlinsky, 1977).

Smith, in concluding his review (1984), noted the lack of research in grouped contexts greater than the dyad or at most the triad. Developing observational strategies that are true to particular contexts and amenable to analysis for such groupings is acknowledged as being difficult and little researched in terms of both observational and analytical approaches.

Writing this thesis some twenty years later it is plain that it is a challenge that has still to be addressed. Even McNeil, writing in 1992, referred

principally to work on dyads or triads and in the classroom setting cited no research up to that time. Goldin-Meadow, reviewing the future prospects for research in children's use of gesture and what it might reveal in preparation for the new Millennium, also noted the need to focus on naturalistic and grouped settings (2000). A further paper published at the time of Goldin-Meadow's review only looked at gesture in passing, among partnered pairs working separately to each other but in the same classroom. It focused on collaborative tasks among reception class, Year 1 children (of a similar age group to those in the current study) and Year 2 children. Gesture was referred to as "…socially directed behaviour, gestures such as pointing, nodding, gaze or eye contact…" but referred to its targeting only in terms of targeting to people (Ogden, 2000 p221). This was surprising as the task context was one of using construction kits to create physical models of houses, in which targeting to materials alone, and as mediators of interpersonal interaction, would have been necessary.

It was noted in the first chapter, that the teacher observing a child assessment activity did not apparently notice the child's use of gesture. If such *gestural* explanations were failing to be acknowledged in the privileged, inter-actional and communicative context of the assessor-assessed dyad, what might be happening in teacher-pupil or pupil-pupil exchanges in larger groups or the open classroom, where multiple contacts and divided attention might be an issue?

In this context each participant, one might imagine, would be subject to a greater number of interactions at any one time than in the dyadic case. This would make it even more difficult for the teacher to recognize gesture based explanations. Equally it would also be more difficult for pupils to recognise those of their peers. In the working classroom, even overtly pedagogic exchanges between teacher and pupil are seldom carried out in isolation from others - other pupils may be waiting close to the teacher to ask a question, the interaction may occur against the backdrop of the rest of the class when listening during circle time or in whole class teaching.

Interestingly, Kelly and Church (1997) have suggested that pupils may be able to exchange conceptual or task related information through the interpretation of other pupils' gestural behaviours. Their research, using a variety of methods, evaluated the extent to which children could infer other children's meanings from viewing their representational gestural behaviour and spoken speech (in the form of video sequences). The children involved were older (approximately 7 years of age) than those in the present study. Nonetheless it is worth noting that they *could* pick up other children's meanings from specific gestures whether speech was present or not and whether the gestures matched the speech or not - the studies were not, however, conducted in working classrooms where environmental factors would have been at work.

In terms of the current study this is important as the work could suggest, firstly, that pupils detect task-related conceptual information conveyed through the gestures produced by other children and, secondly, that this gesture interpretation can inform their interpretations of other children's knowledge and understanding. In the process they would reveal their own understandings through gesture (e.g. Patterson, Cosgrove and O'Brien, 1980; Machida, 1986 and Flavell, Speer, Green and August, 1981). If pupils can do this, it might be thought that teachers would be able to do so as well, thus accessing pupil understanding (Goldin-Meadow, 2000; 2003). Not paying attention to such gestural indicants could lead to underestimation of understanding as suggested in chapter 1.

McNeil has argued that children also use specific forms of gesture to convey what they are thinking (1985; 1987;1992), while Church, Schonert-Reichl, Goodman, Kelly and Ayman-Nolley (1995) have noted that gesture is used during peer interactions. Children also detect the gestural activity of others as is apparent in an affective context in the work of Camras, Malatesta and Izard (1991) and Bugental, Kaswan and Love (1970). These interpretations may have a role in how children make sense of social interactions (reviewed by Crick and Dodge 1994).

Going beyond intra-dyadic interactions there is the possibility that communicative attention could be focused on one individual but allow both members of the dyad to be aware of interactions around them. These peripheral interactions would then be available to the dyadic participants as *additional* lines of communicative information. In the light of Kelly and Church's observations (1997) they would also constitute an additional resource for learning.

The previous sections have defined gesture in terms of its meaning in the current study. They have looked at ways of classifying and organising gesture for systematic analysis. Further, research has been reviewed relating to different forms of gestures from the point of view of both pupils and teachers in the classroom. It has been apparent that these gestures are often not thought of in relation to particular forms of task activity and, more often, have been associated with speech and thus speaking as an activity. The potentially mediating effects of task materials as a key part of the context have not been addressed.

Overall a lack of naturalistic work in the classroom has been identified and the suggestion made that the laboratory based work that has been done is of uncertain usefulness in understanding the classroom context (although it sheds light on the laboratory context as a context in its own right). The tendency to view context as unimportant has also been highlighted. The issue of proximity, however, itself little researched, has been identified as an issue for the group based microsystem at the heart of the current study. What then is known about 'groups' in the classroom setting; what indeed *is* a classroom group and why might the term 'group(ed)', mentioned earlier, be necessary?

3.3 Classroom grouping

3.3.1 Ecological considerations – the group as microsystem

Interactions between one individual and another involve a range of communicative aspects, as suggested in the previous chapter. When a third or fourth party enters into the interactions as a result of a grouped pattern of working the affordances for communication might increase. In Vygotskian terms the opportunities of interacting with more experienced others, even if that experience or knowledge is only slightly greater, presumably offers opportunities for progression through individual ZPDs (referred to in section 2.2.4) as the affordances for such progress have changed. The grouping of individuals for interactional purposes alters both haptic and proxemic gesture opportunities and brings into proximity access to a wide range of facial and other kinesic activities.

The paragraphs that follow explore grouped activity through the ecological perspective of 'the people in the setting' (Bronfenbrenner 1993 p11). These are further informed by cultural psychological viewpoints regarding the cultural and social nature of meaning making, taking into account Piagetian and Vygotskian perspectives.

Face-to-face interaction offers the possibility for the exchange of gestural and speech related communication which is arguably more effective in close proximity to the other person than across a crowded classroom. Equally, separation from direct access to such interactions, by being some distance away, may mark a shift in emphasis towards observation based accessing of affordances, rather than through haptic or more obviously proxemic forms of gestures. A pupil can only lean so far across a table, depending on its size; she may have to watch from a distance rather than lean in.

Dealing with multiple sources of information brings with it its own constraints. These arise from both social and cognitive factors; the former in terms of the social relationships and attitudes in existence between participants, the latter in terms of memory, concentrations and recognition of current events in terms of previous experience.

Proximity, as referred to earlier in this review, privileges interaction between one or a few other persons in close proximity to each other. Proximity supports the occurrence of psychological effects between individuals. Bronfenbrenner (1993) has captured elements of these issues when he identifies three steps that may affect subsequent psychological growth: "...those that set in *motion*, *sustain*, and *encourage* processes of interaction between the person and two aspects of the proximal environment." (ibid p11)[my italics].

In terms of this study, it will be argued that gesture, as it informs communication, is such a process in that it allows aspects of understanding to be made manifest through action. This, first, sets in motion, psychological change through new meaning making. Second, it can sustain interaction between persons: this being the case even when lapses of speech and pauses, for example, occur. Gesture can mark turn taking and opportunities for intervention in the interaction. Third, it can encourage continuing communication, as ideas are explored within one individual, and those meanings are fused, within the group. The two aspects of the proximal environment that he mentions being:

> '...the people present in the setting; and second, the physical and symbolic features of the setting that invite, permit, or inhibit engagement in sustained, progressively more complex interaction with and activity in the immediate environment.' (ibid. p11).

The people in the group microsystem in the current study being, specifically, the pupils and teacher, and their gestural activity. The symbolic features of the setting, aside from those arising from the general culture of the

classroom, are those related to the particular task being addressed. This aspect forms the focus of section 3.4 to follow. The focus in this thesis on the people involved in the setting under consideration - the 'grouped' - arises for two reasons. First that it has not been studied, although pupils spend much of their time in a grouped context in the primary classroom. Second, because it offers a more accessible and manageable setting for observer based examination of the role of gesture between individuals in groups greater than the dyad, (the focus of previous research (Woolfolk and Brooks, 1983; McNeil, 1992 for example)) but less than the whole class.

In this study the nature of those other people - pupils or teacher, male or female and partnered or no-partnered - are all dimensions to be investigated. Bronfenbrenner's second element involves the 'physical and symbolic features' (what Gibson, (1979/ 1986); Reed, (1993) called 'affordances'). In this sense the setting is both the social nature of the groups' interactions (to be examine later in terms of peer interactions) as well as their physical arrangement or spatial deployment. The setting also involves the opportunities presented by the task being carried out. The task offers affordances that arise from, or are associated with, its structure, organisation and materials. These constitute further aspects of the environment in which the group and its members, pupils and teacher if present, are interacting.

In the section that follows the range of pupil groupings and their affordances for gestural interaction are reviewed leading into a consideration of various aspects of grouped pupils as they experience group processes. Some of the variables, such as gender, that may relate to those processes, and which in terms of the current study contextualise the use of gesture among pupils, are also referred to.

3.3.2 Aspects of the 'group'

In the primary classroom pupils spend much of their time in a grouped context. Such groups are of interest as they offer a more accessible, manageable and ecologically more valid setting for observer based examination of the role of gesture in groups greater than the dyad.

A number of variables may influence participants - pupils and teachers - in the interactions in such groups, as might be inferred by the bioecological theory informing the current study (Chapter 2: Bronfenbrenner 1989; 1994; 2001). These might include their roles (as 'pupil' or 'teacher'), and their gender, itself another role. The spatial deployment of the grouped people with respect to each other and others in the room might also be relevant - the interaction between proximity and gesture has already been discussed in the previous section. The setting also involves the opportunities (the affordances) presented by the task being carried out, arising from its structure, organisation and materials. These constitute further aspects of the microsystem 'environment' in which the group and its members, pupils and teacher, if present, are interacting.

Grouping pupils, presumably, increases the likelihood that interactional skills will be developed. In such a context, the teacher is potentially powerful, as she can influence interactions through the way she translates, mediates, transforms and re-presents, as models, gestural and verbal modes of interaction. However, we should recall the point made at the beginning of this chapter, that untrained observers (including teachers and pupils) can extract useful information from observations of others' gestures even when they are from a different culture, different social contexts or of different ages. Extensive research confirms that groupings occur in contemporary classrooms and take many forms (e.g. Blatchford and Kutnick, 1999; McPake, Harlen, Powney and Davidson, 1999; Osborn, McNess and Herrenkohl, 2000).

3.3.3 Pupil Groupings

A range of groupings were apparent in the primary classrooms visited during the piloting stages of this research and these were consistent with those reported by a number of researchers over the last few decades (e.g. Galton, 1990; Galton, Hargreaves, Comber, Wall and Pell, 1999; Kutnick 1994 and Kutnick and Manson, 2000). They can be analysed in a variety of ways. The first might be in terms of group type: seating groups; working groups; co-operative groups, or collaborative groups (Galton and Williamson, 1992). A second approach would be on the basis of task type (Norman, 1978; Bennet, Desforges, Cockburn and Wilkinson, 1984). The third type might use numbers in the group (Blatchford, 2003) related to group purpose: whole-class; small group (4-6 pupils); triads; dyads; individualised (work on their own on a task specific to them as an individual), or individuated (where each pupil does the same task but on their own) as suggested by Kutnick and Rogers (1994).

The various schemes referred to in the preceding paragraphs can be placed on a continuum of composition and organization, with dimensions relating to group size, gender composition, task nature and grouping purpose. Other studies have involved particular spatial arrangements of children around a table, all of whom were apparently working on their own, some as groups of pupils working together in dyadic or triadic arrangements and some who were actively collaborating on a joint activity, with a joint outcome (see, for example, Kutnick and Rogers, 1994; Kutnick, 1994). Each type of grouped setting offers different affordances for gestural interaction as a result of who is present, who is working with whom (the issue of 'partnering'), and the social relations between them. How the groups are managed by their teacher is another factor, according to Edwards (1994), as the teacher determines group composition and organisation.

The observations that prompted this study were made in mixed sex schools in which groups were all girls, all boys or a mix of both. From a gestural

point of view, the lack of research in relation to children and gesture, already identified is also the case with respect to gender differences: a mixed gender group raises issues of the gestural activity of the two sexes as these may differ both in the nature of the gestures used and their pattern of development over time (e.g. in gaze and visual gestures; Fehr and Exline, 1987, in the use of touch, Neil, 1991, and in variation in proximity see section 3.2.11). Up to about the age of seven, pupils themselves will sometimes express a preference for working with same gender partners although this is by no means consistently so (e.g. Bennett and Dunne, 1990).

Experimental studies of *group* processes (reviewed by Galton and Williamson, 1992), among which gender balance was one component, suggest that inter-peer conflict and aggression are reduced in mixed-sex-grouped contexts. While observations of collaborative tasks such as those of Tann (1981) suggest boys and girls behave differently in mixed groups with boys being unwilling to have girls in the group. This difference was apparently linked to the observation that boys had a more argumentative approach and girls a more consensual way of arriving at solutions.

Webb (1991) on the other hand suggested that, provided gender groups were balanced in numbers, they worked well, putting at least as much emphasis on group size as gender itself. He suggested that gender imbalance leads, in a particular group size, to behaviour similar to that reported by Tann above. This is consistent with Slavin's (1990) findings that mixed gender groups were more academically successful. The gender aspect is further complicated by the perceived nature of particular pupils when in particular groups.

Another perspective, offered by Murphy (1997; 2000a), is that boys and girls may bring different views of salience to the same task: what they perceive as being the task, what needs to be done in the same activity and how it may be achieved may have different meanings according to the pupils'

gender. This also extends to their sensitivity to, and identification of, cues arising from the group and task context (task context will be discussed subsequently in section 3.4), and may reflect different perceptions arising from boys' and girls' different cultural expectations and experiences (Kruse, 1996; Ivinson and Murphy, 1999, cited in Murphy, 2000b p157).

Group members, whatever their gender, are nonetheless involved, by virtue of their proximity, in interacting with their peers and the roles they have in particular settings and contexts. This will involve both communication with people and the use of artefacts. If the individuals in the group have poor or underdeveloped communicative competencies, their interactions will arguably be less effective and this may be apparent in the way the group works. Such competency may increase with experience. This may arise in two ways: the first, through an increased interaction with a particular individual, providing experiences that may be applied to others and, second, simply by interaction with a larger number of other individuals.

In addition, another factor to be taken into account, is that pupils less than nine years of age are known to give nonverbal indications of understanding to teachers – nodding for example – when they do not, in fact, understand (Cosgrove and Patterson, 1977).This may also be the case in exchanges *between* pupils, although this has not been researched as yet. This inconsistency may be because they, themselves, are not sure whether they understand and do not express that uncertainty when asked by their teacher (Markman, 1981). This may also be the case for exchanges between pupils. The teacher, when present, would need to pay close attention to these signals. Some research suggests that teachers' sensitivity to gesture in this context is variable and limited (Jecker, Maccoby and Beitrose, 1965) while other research suggests that teachers are no more sensitive to children's gestures than other adults (Goldin-Meadow, 2003, p88-89). However, when given the opportunity to observe children more closely, as part of another procedure, focusing on pupil gestural activity in relation mathematical tasks, they were evidently more sensitive - and the pupils they were working with

appeared to understand more of what was being taught to them (Goldin-meadow, Kim and Singer, 1999; Goldin-Meadow and Singer, 2003). Such sensitivity would be needed by teachers if they were to detect gesture-speech mis-matches, which Goldin-Meadow has argued, reveal a pupil's incomplete understanding, and thus the potential for intervention by the teacher, leading to improved understanding (Goldin-Meadow, 2003, p88-89).

A further issue to be considered, in the context of roles and perspectives in relation to people working together in a group, arises because, in referencing each other's gestures in this way, both pupils and teachers have the capacity to dissemble and convey one meaning, when they actually mean something else. They may do this inadvertently, as when children imply they understand, when they don't, as suggested above, but they may also do it deliberately, through lying.

Adults have problems in detecting lying (Doherty-Sneddon, 2003 ps161-165). Older children seem to be better at lying than younger children and better at detecting when others are lying to them (La Fernier, 1999). This may be because the older child is better able to put herself in the place of another and thus see the deception through others' eyes. This taking of another's role and perspective (Flavell, et al, 1968) is an aspect of the Theory of Mind literature referred to earlier in this review. It is also a specific example of the more general need for one person to take account of the role and perspective of others, when interacting with them. This would have implications for pupils working as partners, but also for teachers working with pupils in a group.

Kutnick and Rogers (1994) point out that working in a group requires the development of an ability to understand others, and their roles in particular context, and to interact with their perspectives. They further note that this is independent of age but is related to experience and culture. This notion that others may have a different view to oneself develops further around the age

of 6-7 by allowing that others' views are not only different but may be wrong (Perner and Wimmer, 1985: see also Ding and Flynn, 2000). A child may also be able to apprehend that another's perspective or view seems wrong but may not be able, as yet, to explain it to the other person in words although they may do so through gesture.

Webb and Farivar (1999) have also suggested that if peer collaborative work is to be effective, pupils need to be helped to gain trust and confidence in the views of each other through work on listening to each other and the giving and receiving of opinions and views. As gesture often accompanies explanatory interactions, gesture may have an important role in such activities.

3.3.4 Grouping and proximity

Common to all the classrooms observed at the outset of this research and those whose activities became its focus, was the practice of having pupil worktables grouped as a single unit. In this sense, participants could be 'grouped' spatially even when they were not working as a 'group' in a cooperative sense as suggested in chapter 1. This physical arrangement of tables allowed between 4 and 6 pupils to be seated at the same 'larger' table, with the occasional use of rows or pupils as pairs. This physical grouping could itself allow greater affordances for an action than would be the case were separate tables to have been used.

This is consistent with Mortimore, Sammons, Stoll, Lewis and Ecob (1988) in relation to London schools, and of Alexander (1991; 1995), in the late 80s, for schools in Leeds. Galton et al (1999) in the 1990s found the same emphasis on grouping but also remarked on the appearance of horseshoe shaped arrangements in which pupils sat round the edge of the horseshoe and the teacher worked inside the shape, thus being visible to all. This same

study commented that there appeared to have been little change in this pattern of classroom organisation since the original ORACLE project in the 1970s (Galton, Simon and Croll, 1980).

What these studies also have in common was the observation that whilst pupils might be seated in groups they did not necessarily *work as groups* very often. A similar account has been given in the work of Kutnick (1994). These grouped tables were located in classrooms that had a carpeted area as communal space where some whole class work and registration was carried out. The word **group(ed)** was introduced in Chapter 1 to differentiate it from a group. The use of 'group(ed)' in the current study thus tries to capture the ambiguity that this arrangement evokes: pupils were physically and spatially grouped but were not working on a whole group task. Proximity and the sharing of resources must necessarily lead to social interaction (involving speech and gesture) between members of the group as the task proceeds. Even in apparently individual work, engagements with others would be a part of the social and thus communicative context in which the group members were working.

However, in the observed classes, some whole class work was conducted with the children sitting at a particular table place. This was usually not the place they always sat in, for, as the studies mentioned earlier also comment, the classrooms in question tended to be zoned with particular areas associated with particular curriculum based activities: a reading area with books on display, a maths area, etc, reflecting a grouping of affordances related to particular curriculum activities rather than, necessarily, particular interactional structures. The classroom became, in a sense, a 'mini-school' (Alexander 2000 p183-4) with a central coming-together area and distributed focuses for learning around the periphery of the room. In moving between one and the other pupils were, in effect, peripatetic (op. cit. p184).

Particular individuals might be doing different tasks at the same table, or, alternatively, might be doing the same task differentiated according to ability.

However, some might be working collaboratively on the same task. Pupils were therefore exposed to changing patterns in who was working near them.

There has been comparatively little research on the learning related *effects* of seating arrangements *per se* and their *impact* on learning. One study (Bennet and Blundell, 1983) based on a short observation period found no obvious differences in educational outcome (the study used a two week observation period and looked at 10/11 year olds). It focused on attainment but other aspects have been examined in the context of pupils working independently but in a grouped context and focused on children's attention and work engagement (Axelrod, Hall and Tams, 1979; Wheldall, Morris, Vaughn and Ng, 1981; Wheldall and Lam, 1987; Yeomans, 1989; Hastings and Schwieso, 1995). Various authors have reviewed these studies across settings (Merrett, 1994; Hastings, Schwieso and Wheldall, 1996). The studies in question compared gains when pupils worked in groups or in rows. Across these studies, working in rows seemed to produce greater gains than working in groups.

As Hastings points out (2001) this is only important if the difference in attention and work engagement is educationally significant. He used the index of a *gain* in time on task as a result of the different strategies and cites gains of between 16% and 124 % when going from group work to pair work. This has to be strongly qualified by the fact that the age ranges of the pupils involved varied between 7 and 8 year olds (for example Axelrod et al, 1979; Hastings and Schwieso, 1995, Experiment B) and 14/15 year olds (Wheldall and Lam, 1987, Class 1) and on the basis of the type of tasks used in the studies.

In addition, the variation in age may contribute to the variation in on-task behaviour. Perhaps through a greater ability to concentrate or through greater experience in approaching and completing work (reflecting access to a broader range of affordances when undertaking particular tasks). It must also be noted that all the children referred to above were older than the

children in the present study. There are, at the time of writing, no similar studies in the UK looking at this age group, in this context.

What these studies *did not* identify was the extent to which particular forms of interaction militated against on-task behaviour and which supported it. What they also did not address, and is another instance where the current study goes into new areas, is what the actual interactions were within the grouped context; who or what was targeted during the interactions in question. This would be related to the pattern of pupil interactions built into the task. A requirement for pupils to work as partners during a task offering different affordances compared to when individuals were working as a whole group. Equally the change in their physical arrangements might offer different affordances for interaction. The grouped setting could also be a context for paired and triadic work which might take on aspects of the pupils' interactions in pairs. The studies referred to above also did not identify the nature of verbal or gestural contributions to the 'distractive behaviour' commented upon. Neither did they look at the role or impact of the teacher's interaction with the grouped pupils.

These studies have focused on task activity and time on task. Nigel Hastings (2001), in reviewing the issue of pupil groupings, suggested that the rationale for pupil grouping in the classroom was of fundamental importance. The first of the three aspects he identified was a managerial issue that affected task organisation. Having pupils seated around one surface meant that resources could be placed in the centre of the surface and would be available to all. This would encourage interaction as well as reducing the need to provide multiple sets of materials, thus simplifying classroom management. An implication of this is that materials would be visible to all and, from the point of view of this thesis, suggests that the interactions taking place (both verbal and gestural) would be also visible to all, as well as being mediated by the use of materials in a particular task. ZPD's might be extended by the witnessing of others' interactions (discussed further below).

The second and third issues referred to by Hastings (2001) were more obviously pedagogic in the sense that they related to teaching strategies directly. The second rationale given by Hastings (op.cit.) was that this arrangement allowed small group teaching and the third that it allowed cooperative and collaborative work.

Hastings points out, however, on the basis of a review of the extensive literature around pupil groupings (referred to earlier, op. cit.), that these pedagogic justifications for grouped tables were aspirations on the part of teachers rather than how classrooms were actually run. He suggested that around 20% percent of interactions in the classroom were with groups.

In terms of the third rationale, Hastings (ibid.) focused on pupil-pupil interactions on the basis that these would be more frequent where pupils were involved in grouped activities than if they were solely involved in individual activities. The former would be associated with small group based work. As reported in the ORACLE studies referred to earlier, such interactions accounted for only 13.5% of observed work related pupil activity in 1996. Although this reflected an increase from the first ORACLE observations in 1976 of 5.2 percentage points, it still suggested that despite the apparent change the pedagogic reasons for grouped work, suggested earlier, were not being operationalised in practice. In addition, the teacher's involvement with the group ranged from occasional monitoring visits to the pupils as they worked, through supporting a particular child, to the much less frequent situation in which the teacher spent an extended period with the group, actively organizing its activities.

However, in practice, even when pupils were seated in a grouped fashion, teachers predominantly worked with individuals in the class rather than with small groups. Even when working with individuals, this may have been in the context of a grouped pupil arrangement (Galton and Williamson, 1992). If

grouped pupils are working on collaborative tasks additional skills may be needed; these may be mediated by gestural interaction. The next section looks at the issue of collaborative groups in this context.

3.3.5 Collaborating groups

It might be anticipated that for pupils to work in a grouped context, some training of the group in strategies for working together would need to be in place (for example, Bennett and Dunne, 1990; Kutnick and Marshall, 1993). Given the social and interactional nature of training pupils for collaborative work, such training has often focused on listening, questioning, challenging, helping and answering skills (Bennet and Dunne, 1990; Hall, 1994). It would be surprising if gesture and how gesture was used and targeted in such communicative tasks did not play a part in these interactions, although the role of gesture has not been studied in this context. Where a teacher works with a group in the training of these skills she may act as a model for the way interactions (including gestural ones) are managed and targeted. Pupils might then add the modelled behaviours to their own interactional repertoire (they would thus have implicitly accessed the affordances of the activities they were experiencing).

Preparation of students for small group work may also need to include work on accepting help from others which would require clarity about what such help was intended to do (Webb and Farivar, 1994). Webb (1992) suggests that such help would have to be "...timely, relevant, of sufficient elaboration, understood by the recipient and applied by the recipient to the problem in hand." (p103). With young children this is more difficult than with older pupils as the means of mutual instruction would be more limited (children of this age group have usually not mastered writing and reading).

Mercer (1995) identified three types of classroom *talk* that may also be apparent in groups. The first, *disputational talk,* involving disagreement, with an assertion being met by a counter assertion would not, in Mercer's view, lead to useful meaning making (whereas in Piagetian terms, the resulting cognitive conflict would lead to a change in schema and thus learning), rather it served simply to reinforce established positions. The second involved the uncritical compilation of offered ideas; an argumentative listing of points made, constituting a *cumulative talk* type of interaction. The third type, the *exploratory talk,* offered possibilities for mutually constructive interaction as it offered the opportunity to structure arguments openly between participants, which can then be criticised and appraised by participants, having been constructed by the group, rather than by a lone individual. This does, however, imply a need for openness between participants if exchanges are to be useful. Pupils may not be able to be as open as required, or they may actually dissemble, as suggested earlier in section 3.3.3, in the face of discussion and cross-questioning.

Mercer suggested that truly collaborative interactions would show a high level of exploratory talk and less of the other types of talk - all three modes of talk being social. Presumably gesture, and its targeting, would have a role in these exchanges. Other factors, which may have an indirect bearing on gestural activity, have been identified as being important in effective collaborative working in small groups. These include individual accountability and motivational reward structures (Cohen 1994). Gestures, not having the fixed and thus accountable nature of words, may be used to express partly formed ideas without the potential 'come-back' associated with the more explicit nature of speech (Goldin-Meadow, 2000). By targeting such understandings to the whole group these partly formed ideas could be given a greater availability and currency. Not only what is produced but how it is targeted would be an issue.

A range of research suggests that the *type of task* being undertaken and the *composition of a group* have a significant effect on the possibilities for

collaborative action (Webb and Palincsar, 1996; Cohen, 1994; O'Donnell and King, 1999), although the variable definition of what a collaborative group is in this field hampers research because it is not clear what a "collaborative group" actually is.

Developing meaning through social interaction in a collaborative framework implies that knowledge is socially constructed. Various researchers have explored aspects of the validity of this view (e.g. Mercer, 1995; Rogoff, 1998, 2003; Säljö, 1998). However, simply working in a group in this way does not mean that positive learning takes place (Van der Linden, Erkens, Schmidt and Renshaw, 2000; Dillenbourg, 1999). If collaborative learning "...asks for a coordination of actions and aims towards a shared meaning as a result of the negotiation process and towards a common learning process" as Van der Linden et al suggest (p49), then one way this may be mediated is through social interaction. This necessarily involves gestural and speech based communication. Research with this focus (e.g. Erkins, 1997, cited in Van der Linden et al, 2000 p42/ 49) needs to look at more than the effect on an individual, if the social learning aspects, referred to in earlier chapters, are to be addressed. This requires an understanding of the relationship between individual learning and social learning (Salomen and Perkins, 1998), on the one hand and what it is that is being learnt, on the other hand. Accessing the affordances of different tasks should, from a social learning perspective, involve improved learning in a collaborative context as shared learning involves sharing both *affordances* and *decisions* about affordances.

In such a group social setting, a teacher, making informal (or formal) assessments of pupils' understanding in the course of a particular task, might be in a position to assess their current understanding by attention to the nature and content of their interactions. This would carry the risk, however, in focusing on those who could express their understandings in words, that those who could only partially express their views in this mode or

who used gesture alone for explanatory purposes, would be unrecognised, and thus have their progress underestimated.

Might not the grouped setting offer *more* opportunities for group members to learn as a result of observing interactions between teacher and pupils, by virtue of its communicatively more intimate, but bounded, nature? This would arise because, in trying to help a particular pupil to express her particular understanding, other pupils would be able to 'witness' the help given to her by her teacher (as suggested in terms of multiple ZPD's in sections 2.2.4 and 2.2.5 earlier). Other pupils would be witnesses of the elicitation of help by the pupil concerned and the teachers' use of words, gestures and actions in responding to the request for help. They would have access to the help itself, as a model of how particular help may be requested and an experience of its effectiveness as a strategy, without incurring any social risk to themselves. As a result not only is the content of the interactions made available to the 'witnessing' pupils but the modes of explanation, use of language and gesture are also made available.

One implication of this being that it would be possible to learn about both successful and unsuccessful strategies from the opportunities presented by such a grouped setting. Ways of establishing contact with the teacher (haptically and kinesically) might become apparent as might ways of explaining particular ideas using particular gestures and, by implication, making apparent gestural strategies that did not work (intervention, pausing and turn taking gestures for example).

Further, pupils might gain access to the gestural components of object related gestures as equipment was manipulated by individuals in the group. In addition, the possibility of identifying at one remove, conceptual or procedural learning (in the sense suggested by Kelly and Church 1997) might be raised. An associated possibility would be that models of

unsuccessful strategies could be observed *without* the personal cost of failing oneself, or being seen to fail by others.

This section has looked at what is currently known about the nature of group(ed) arrangements of pupils, and identified aspects of groups that will be need to be considered in the analysis of their gestural interactions, such as group size, gender balance, the role of partnering and teacher involvement in the group. So far gesture and the group(ed) as a context in which gesture may be used communicatively has been reviewed. What the group(ed) *do* as they work, their *task,* becomes the focus of the last part of this review.

3.4 Classroom Tasks

3.4.1 Task in the microsystem

The interactions of persons working in a grouped setting have, as a crucial part of that context, the task they are engaged in and its affordances for activity. These represent opportunities for both interpersonal and object related interactions. These interactions offer affordances for learning and increased meaning making, mediated by gesture use and observation of, and interaction with, the gestural activity of others in the group. However, just as the task offers opportunities for interaction it may also impose constraints. The task frames the activity of the group microsystem and its purpose. It does this by providing the rationale for its being formed in the first place, at a particular place and time, in the ecosystem of the classroom.

Notwithstanding any teacher planning involved, pupils' experience of a task is that of the task being undertaken *by them*. Gauging pupils' response to the task, as it was carried out, would involve both verbal interaction on her

part (asking if help was needed, etc.) and observation - through monitoring - of the progress of the work. It was suggested in Chapter 1, and earlier in this review, that gesture could reveal incomplete understanding on the part of pupils and more broadly how pupils were engaging with the task they were undertaking. To be able to detect and engage with such gesturing requires, it might be supposed, a high level of sensitive observation of the children concerned. The opportunity to do this may be affected by the organisation of the task itself - the extent the task requires the teacher to be personally involved in its working, via the supply of resources or advice, and this involvement may militate against her being able to engage in monitoring activity to the extent required to reveal understanding. What follows looks at the issues of task purpose, structure and content and what each of these may offer for group(ed) participants as they engage with particular tasks and the extent to which teacher involvement is required or needed.

3.4.2 Task purpose

A number of approaches to the issue of task purpose have been proposed. Three accounts are considered below, each offering elements relevant to the ecological perspective discussed earlier. The first of these perspectives was that offered by Doyle (1983). The purpose of academic tasks, he suggested, could be viewed in terms of three criteria: the first were the *products* it was anticipated the pupils would produce, such as an essay or answers to a question, second, the *operations* they would use to produce this outcome and third the 'givens' or *resources* available to the pupils to allow them to proceed. Ecologically these capture the process element of a task and how it is serviced for particular outcomes. Tasks, in this view, focused pupils on particular *aspects of content* or *ways of processing information* (Doyle, 1983, p162). They also necessarily acquired, in the process, the procedures and operations needed to operationalise the task in action (the experience of doing the tasks gave access to its affordances).

As a result Doyle suggested that *accomplishing* a task offers two consequences for an individual: the first was acquisition of knowledge. This could either be in terms of content or strategies (offering different affordances in Gibsonian terms). Secondly (ibid), he suggested that the practice of operations, such as memorization, may be transferable to, and applicable in, other contexts (so affordances could be available in other contexts consonant with Gibson's view).

Doyle further suggested four categories of task type (op. cit. p162-163): memory tasks, procedural / routine tasks, comprehension / understanding tasks and opinion tasks. In adopting a schema based perspective, he also suggested that memorization was an incidental to comprehension type activities while procedural tasks were characterised by the need to embrace particular sequences of activity to solve a task. In his view, comprehension involved knowing which procedure to use and when (selection between affordances). In all types of task, he further noted, prior knowledge was significant, domain specific and domain general (op. cit. p163-173). He also noted that age and ability may affect a pupil's engagement with tasks as a function of her general cognitive development.

The emphasis on the academic nature of tasks in his analysis was balanced by an appreciation of the need to view a task as embedded in the activity of the classroom with its implied social component (op. cit. p162). He noted further that a class as a whole is a group which may be split in different ways for different tasks (thus generating smaller groups – just as an ecosystem may be subdivided according to the unit of analysis applied to it) and that this is as much a management issue as a learning context issue (op. cit. p179).

In Doyle's view, pupils' cooperation (and acquiring and maintaining this cooperation) was a core activity for the teacher as she worked with a class (ibid.). Securing this agreement to participate acts as a bridge between the organisation and management of the classroom and the affordances made

available for the children to learn. This learning is mediated by the tasks the teacher designs. This, in turn, may be influenced by affective aspects of the pupils' relationships to the teacher and the way teachers express enthusiasm for the task in hand.

In a social context, Doyle noted that students were required to attend selectively to a wide range of information (op. cit. p180) and may need to respond to offers of support, both about tasks and within tasks. These may derive from the instructions given and the context established by the teacher in introducing the specific tasks: this focus being achieved communicatively in a variety of ways. Peers, in their turn, are also important sources of support, and through interaction this support could be entrained for the solution of particular tasks (ibid.). This implicitly acknowledges the potential for pupils to access the affordances of each others' experiences – either through direct interaction with them or by witnessing their interactions with others, in the context of the task.

One issue he identifies is that participation in an activity puts a pupil in a position of potential risk in respect of the answers they give and what this says to their peers and the teacher about their current understanding and competency. Gesture, being less formalised and, in language terms, less publicly agreed upon, affords a less 'risky' communicative medium as suggested earlier.

Doyle concludes that instructional materials need to be evaluated for their usability and intended purposes. When Instructional *strategies* are implemented with pupils, consideration needs to be given to the communicative and use aspects they embody. In addition, pupils need to be given strategies to deal with the risks associated with making public contributions to tasks (op. cit. p188). This may mean teachers need training in these areas (a view taken by the CASE study referred to earlier (Adey et al, 2001; Shayer and Adey, 2002) and that pupils need similar preparation.

A second, more flexible approach to tasks, and one more suited to the primary school context, was that suggested by Norman (1978). It was less obviously focused on academic tasks than Doyle's had been and was more ecological in perspective. His typology of learning tasks tried to address the continuum of *focus* and *context* to be found in the working classroom and implicitly placed an emphasis on *task purpose* as a key aspect of task types.

The first of Norman's (ibid.) five task types related to the purpose of introducing new ideas, strategies, procedures or skills, a key aspect of which was the identification of, or discrimination between, the items introduced (arguably emphasising the accessing of affordances as an activity). These he identified as *incremental* type tasks.

The second type focused on the purpose of encouraging a child to re-organise or re-structure their current understandings, skills or interests. This occurred as a result of their having to invent or discover, for themselves, some new relationship: the *re-structuring* type task (re-appraising strategies leading to choice-making between alternatives).

The third type was one requiring pupils to apply familiar skills or knowledge to new situations to extend their existing competence. In affordance terms this would encourage pupils to test existing strategies in new situations sharpening their choice making skills. This could also involve the synthesis of existing knowledge, or skills, in the service of a new task: the *enrichment* type task.

Fourth, the application of new skills to existing problem types so as to practise their application to develop mastery: the *practice* type task. The last type of task were ones that required pupils to re-visit existing knowledge, skills, and procedures which had not been used for some time: the *revision* type task. Here the opportunity to see if affordances for action were

consistent, when particular strategies in particular types of task were used, was itself afforded. Clearly some tasks might involve more than one of these purposes while others might have a single purpose.

Research using this type of typography, for example that of Bennett et al (1984), suggested that in the case of infant classrooms, there was a predominance of practice tasks (60 %), with incremental tasks (25%), restructuring and enrichment tasks (7%) and revision type tasks (6%) making up the balance (allowing for rounding errors). This may not be surprising given the emphasis on learning basic skills at this early stage, many of which appear to rely on practice as a way of establishing physical competency and conceptual stability in the child's mind. One might have thought, however, that extending those skills would be a priority if children were to progress. There is a sense in which Norman's typology embodies a Neo-Piagetian, almost staged, conception of learning which is transformed in Bennett et al's (op. cit.) view, towards a more obviously neo-Vygotskian view through an emphasis on supporting pupil learning.

More recently a third approach has been developed, that of Edwards (1994). She has suggested a four stage model of learning in respect of task type and use. This involved, first, introducing new information, skills or strategies to pupils (offering affordances) and, second, giving them opportunities to make sense of them (offering opportunities to assess and decide upon the utility of particular affordances in particular contexts). This would then be followed by activities that allowed pupils to 'fine tune' these new skills, strategies and knowledge (refining strategy judgements about which affordances to access in particular task types). Lastly, activities that allowed pupils to incorporate what they had learnt into their existing understanding would round off the learning sequence. This would allow consolidation of strategy assessments and their usefulness to be mapped into existing experience.

This last account seemed to describe the teachers' intentions expressed in the way tasks were being used in the classrooms in the current study, modified in the case of the teacher-in-group classrooms by the use of the CASE derived tasks. The staged approaches and models described above are, however, only indicative, as the processes they describe are continuous.

Consonant with the neo-Vygotskian emphasis apparent in Edwards' view is that the teacher has a clear role in supporting learning and there is a need to build this into task purpose in a structured way. This 'assisted performance notion' (Tharp and Gallimore, 1988) is consistent with the Vygotskian notion of the Zone of Proximal Development which gives a more experienced other (be it teacher, other adult or peer) an explicit role in supporting the learner to extend their current level of understanding. Thus the purpose of a task needs to include a consideration of the teacher's role (where support is progressively reduced over time as the child becomes more confident and experienced) in the structure of the task and how their support contributes to the development of the child's learning.

As suggested previously, this may be more straightforward in a dyadic context because the teacher is focusing on the understanding of one child only and thus on the gestural and speech information revealing that understanding. In the whole class and whole group setting more global aims need to be considered, which by their nature lend themselves to meeting the needs of many pupils at once. Whole class interaction may be used for information giving, scene setting or the making available to all *at the same time,* particular information, learning opportunities etc. This would also be true in a small group where the teacher was setting the scene for the group's subsequent activity.

Part of task purpose is thus managerial (as suggested by Doyle, 1983 above) in relation to the process of doing a task, as it allows the same information or learning experience to be made available to many children at

the same instant. In a small group context the opportunity to gauge learning is arguably less than in a dyadic interaction for the reason just given, but more useful than in a whole class context. The purposes attributed to a small group task can therefore more easily accommodate explicit learning activities in the sense referred to by Edwards, above (1994).

However, as Bossert (1988) implied, planning such purposes in a group context implies a relationship between pupil interaction and the nature of the task in hand. Task purpose thus needs to be considered in terms of *potential pupil interactions* as well as pupil understandings. How this works in practice is through the task structure as discussed in the next section.

3.4.3 Task structure

Although a particular task might embody a number of the specific activities referred to above, characterised through Edward's model of task purpose, Doyle's notion of process and Norman's ideas about focus and context, other issues are apparent. The first is that of the specific activities or task elements involved in the task and how they are sequenced in the overall task structure. This could be thought of in terms of pupil roles, support needs or pupil interactions.

A second aspect would be a question of how the teacher, in her role as classroom manager and face-to-face educator, interacts with particular aspects of the task at particular times. The effect of this on the pupil roles, support needs and pupil interactions links these two points together.

Third, how these issues impact upon and contextualise the communicative aspects of the interactions that take place may be significant. The nature of the activity itself, a discussion element, for example, clearly offers particular

opportunities for particular types of skill or competency development (particular affordances): in this instance, listening, interpretative, analytical, and interactional skills. An activity involving the cutting out, and sticking down, of a picture in a particular place in, for example, a categorisation activity, offers different opportunities to that of a discussion item, although, in practice, a discussion element may enter into the cutting-out activity, in an informal way.

Another aspect of task structure, picking up on Doyle's 'process' concerns and those of Edwards, is that of the degree of interdependence among group members in the production of the task and its outcomes (Bossert, 1988 p228). This relates also to the question raised in the last paragraph about how the role of the teacher, in the task and in the classroom more generally, impacts upon interactions in the group microsystem. This interdependence is important (Miller and Hamblin, 1963) as it may enhance productivity and stimulate the development or sustaining of friendships.

A number of approaches to the question of roles and task structure have been examined (a sample of which are mentioned below). Johnson et al (Johnson and Johnson, 1975; Johnson, Johnson, Holubec and Roy, 1984) refer to a group of four to five pupils working in mixed groups collectively on a single instruction worksheet delimiting their particular tasks. This approach required prior instruction in group interaction processes and the use of in-process monitoring by the group of how they were interacting with each other. Pupils were trained to be independent of the teacher's interaction with them.

Another approach involved breaking the task into small elements each of which was allocated to a particular group, generating 'expert groups' who worked on one aspect of the task contributing to a whole solution. Here the teacher's interactions with pupils were focused on the interaction between groups at the task integrating stage (when groups shared their expertise in a communal solving of the task). Each 'expert' group being empowered to

seek her advice but to act independently. These then taught other pupils so that the whole class learned through the expertise of the smaller groups – the 'Jigsaw method'. This has been investigated by Aronson, Blaney, Stephen, Sikes and Snapp (1978) and extended by Sharan (1980) who also noted that this approach increased pupils' liking for the group, the school and self esteem.

Slavin (1983), in what was described as the 'Student Team Learning' approach, used a variety of different cooperative approaches with his groups of pupils. These focused on completing assignments in small groups, with each group making a variety of contributions to subsequent, intergroup, competitive activities. Within a particular group, however, the activities involved cooperation. The two aspects of the approach – the intragroup and intergroup - emphasised learning in the service of others thus suggesting that learning was being done for oneself and for others. Here the teacher monitored, supported and facilitated the activity of pupils in groups.

The foregoing different forms of organisation offered different opportunities for communicative interaction through different sized groups and mixes of participants. They also offered teachers different opportunities to manage their interactions with pupils in the groups concerned and, by implication, how pupils managed interactions with each other. This was brought about in each case by the way the task was structured and organised by the teacher.

Johnson and Johnson (1985), in reviewing the mediating aspects of task structure, suggested that several factors were involved; the reasoning strategies deployed, the way opinions were reconciled and examined, the opportunities for orally rehearsed explanation of problems and peer encouragement of learning. It is noteworthy in the present context that gestural interaction was not considered in a communicative sense although all the activities suggested could involve a need for interaction – gestural and verbal. It embodies the apparent assumption in much of this work

(further reviewed by Bossert (1988)) that communication in this context is verbal or speech focused only.

More recently, Palincsar and Herrenkohl (1999 p158), in a discussion of how to design collaborative contexts using reciprocal teaching, suggested that creation of a shared social world was a key factor in making tasks that were effective. Like Doyle, they drew attention to the risks associated with this and the need for a supportive environment.

Where the teacher is *a member of a group* undertaking a particular task, planning would need to be more comprehensive, for, while the teacher was engaged in detail with one group, she would be, by implication, less available to other groups. In such a situation, despite being associated with one group, she would still, however, remain a presence in the room and a point of reference for other pupils. Pupils would presumably, therefore, need some training to be able to *not* refer to her immediately a question arose, when she was working with one group for an extended period. The presence of other adults in the room (e.g. classroom assistants) might help mitigate this aspect.

Cooperative learning, as an approach informing all the examples given in the preceding paragraphs, has not focused on the actual talk and gestural interactions of pupils working in groups in naturalistic classroom settings. It has tended to focus, instead, on the learning process and its management and the associated outcomes. It has not attended to how those outcomes have been mediated by the interactions involved.

The teacher's role in structuring tasks has been further examined by Meloth and Deering (1999) who note that collaborative interactions are positive for the individuals concerned. Where guidelines for talk have been developed with children, follow through and support is needed to make them effective (Meloth and Deering, 1999 p237). In fact in these authors' survey of 100

studies of cooperative learning between 1980 and 1992 fewer than 5% investigated group discussion content.

Webb (1989) reviewed 19 studies that examined peer interactions and discussion in maths and computer instruction. The resulting analysis confirmed the importance of discussion as mediating group success (the role of gesture was not explored in the studies contributing to both reviews).

Summarising their work, Meloth and Deering (1999 p238) noted that task related *talk* about facts, concepts, strategies and thinking was very important for pupil learning in the cooperative context and, secondly, that opportunities for fostering high (that is, more conceptually advanced) talk needed to be integrated into the task structure as, without this, it only emerged naturally at a low level. They also suggested that this appears to indicate that direct involvement in pupil tasks is needed for this type of higher level of interaction to take place. However, they also suggested that this need for the teacher to be involved if higher level learning was to take place may be mitigated by prior preparation of pupils, a point made earlier.

The structure of the task and the teacher's involvement in its implementation may permit particular forms of spoken and gestural interaction. This may be either explicitly, through the instructions given (e.g. do not touch this item, or hands off the table while I am talking) or through the way pupils are arranged for particular aspects of the task, as, for example, if they start as pairs and then combine views as a whole group. Any analyses of such interactions must, therefore, take these structural elements into account when analysing the data produced. It may also be the case that the simple presence of the teacher in the group may so dominate interactions (given her classroom role as a source of local discipline) that other aspects of interaction may be eclipsed.

3.4.4 Task content

If a task is one aimed at pupils applying existing understanding to a new context, doing so on their own offers different opportunities (affordances) when either a partner or group is involved. If they are doing so in a context where they were effectively working with themselves, communication needs would be different compared to one where they were working with another person (e.g. a partner). In the latter case, part of the interaction would involve negotiating common starting points as a basis for mutual progress in the task.

If the child were part of a grouped pupil arrangement, these opportunities would be increased and made more complex by virtue of the range of views and strategies available (the opportunity to access the affordances of others). This would be further complicated by the presence of a teacher who might be assumed to be (and might take on the role of) an expert, with detailed knowledge of the issue in question. The way in which that expertise is released and made available during the task could affect the opportunities she has to produce particular forms of gestural activity and thus its availability to other members of the group.

From a Vygotskian perspective it would raise questions about the likely effectiveness of bringing particular pupils through their ZPD: some pupils might have more access to their teacher than others. The grouped setting need not imply equal access to the affordances of having the teacher as part of the group. The teacher would have to acknowledge this and alter her gestural and interactional activity to take it into account. She might make a point, for example, of targeting each child in the group a particular number of times. This would share the cognitive load of personal and task related interaction for individual pupils (Goldin-Meadow, 2003, p145-166), and for the group, by making gestural activity available to all in the group (ibid.p116-131), as a whole where the task required a focus on common, and shared, activity.

Further examples of this would be, first, when the teacher modelled the dimensions or mode of interaction of parts of an object by using her hands in the space before her, offering gestural, rather than just speech, affordances for pupils. Second, she might point to a particular material or aspect of a diagram bringing its importance, in relation to the task in hand, to the attention of the pupils.

The same consideration – the need to have multiple opportunities and forms of explanation, utilising different communicative modes or channels – available to them would apply for pupils and teachers. For the former, this would be for learning, and for the latter, monitoring and feedback. Both types of participant would be looking for clues and cues in the actions of each other in relation to the conceptual focus of the task at that moment.

The nature of the content of a task may itself permit particular forms of interaction. Pupils and teacher need to understand the information they are accessing. This is in the particular context of the task and the expertise that particular others may have, but may not make immediately available.

3.5 Summary points

At the end of this review of the literature relating to gesture, groups and tasks, it is apparent that gesture has been little studied in the target age group of this study (5-6 years). Little research has been conducted in the naturalistic setting of the primary classroom in this context and thus may not reflect current pedagogic concerns or interests. Notwithstanding the near universal use of group(ed) work in those same settings, comparatively little is known about interactions in the groups themselves. Equally the role that gesture may play in those activities as a key mode of interpersonal communication is virtually unexplored.

Although various theories exist about the significance and nature of tasks, their structure, organisation and purpose, these too have tended to focus on the work involved rather than the interactions that allow that work to take place. The contribution that interpersonal communication and, in particular, gesture may make to the completion of a task has also barely been investigated in this setting. Equally, what tasks permit in the early primary school setting, through their use and organisational form, has been little investigated, gesturally, or otherwise.

With these gaps in what is known identified and drawing on what *has been* studied, the next chapter maps out the methodology used in the current study. This methodology describes how observational data was obtained concerning the gestural interactions associated with, and informing, task activity among boys, girls and teachers as they worked, sometimes together, in particular group(ed) tasks. Chapter four also describes how the data was categorised for analytical purposes.

Chapter 4

Methodology

Chapter 4

4.1 Introduction

This chapter starts by describing how the research design used to address the research questions initially posed in chapter 1 was developed. It then identifies the population characteristics of the participants and the nature of the setting being observed. This leads into an account of the methods used to gather the observational data at the heart of the study. The chapter concludes by identifying the detailed characteristics of the groups actually observed, contextualising the results to be reported in chapter 5.

4.2 Research design

The research questions given at the end of chapter 1 were:

(1) What gesture patterns were used by pupils and teachers during task-activity in groups?

(2) To what or to whom were gestures directed in these groups?

(3) How did gesture-use relate to task-activity in these contexts?

(4) What implications did gesture-use have for teacher management and engagement with pupils as they learned in a group?

In order to investigate these research questions a number of decisions had to be made which informed the development of the research plan as a whole. They are explained in the following sections as the research plan and its development are described.

4.2.1 The TOG and TIG settings

To maximise the chances that any differences in the gestural behaviour of teachers and pupils between settings would be apparent, it was decided to use two settings that allowed, arguably, extreme forms of the group(ed) arrangement. In addition, both would need to be examined in the working classroom so as to offer as much ecological validity as possible. The first setting was identified as one in which teachers had little direct role (or activity) among the group(ed) beyond servicing their needs in terms of resources and providing any help needed to complete a task: the teacher would not be a member of the group(ed) arrangement (the Teacher-Out-of-Group, TOG, setting). The second setting, on the other hand, would be one in which the teacher *was* a member of the group and necessarily taking part in the task being undertaken (The Teacher-In-Group, TIG, setting).

4.2.2 The curriculum context

Being in a naturalistic setting the tasks involved needed to be those that were normal for that particular setting. They also needed to be in a curriculum context that would be reliably available in all the classrooms, such as English, Mathematics or Science. They would also need to involve a wide range of different task types, including those that used different sorts of materials in

practical activities. Science at this level (Year 1 of Key Stage One in the National Curriculum) is often taught in an integrated way, using a range of such materials. It also involves a variety of reporting–type activities: posters, writing, sorting activities, for example, that would offer opportunities for observing interactions. As the author had a background in science teaching, this curriculum area became the chosen curriculum context for the study. However, finding activities that were undertaken with the teacher at a grouped level as suggested earlier was likely to be difficult, not least because, as the literature review suggested, such work was not common in contemporary working classrooms.

4.2.3 Sample context considerations

In addition to a consistent curriculum context, the pupils and teachers involved would need to be as homogeneous in their characteristics as possible if the effectively quasi-experimental approach of the study was to proceed. The pupil groups to be involved would also need to be in classrooms where group(ed) arrangements were the norm; where pupils had had the time to settle into their new grouping (Year 1 being the beginning of formal schooling in this context) and where other adults were a normal part of the classroom environment. The presence of an observer in such classrooms could then be regarded, after due acclimatisation, as another adult in the classroom from the pupils' and teachers' points of view.

In addition, as observations were to be made of group(ed) pupils, it was decided that at least two groups needed to be studied in each class. This was in order to, first, increase the representative nature of the observations for the class as a whole and, second, to increase the homogeneity of the observational context between groups in the same class and, finally, to make the likely pattern of observations practicable. Schools with two forms of entry for year one, if

possible, needed to be used as these would increase the school ethos element of the homogeneity for the sample. Where such a setup was used in a school there would also be the possibility of teachers sharing tasks and resources between groups in the same school, further increasing the homogeneity of the sample.

4.2.4 The observation settings

In terms of the observations, a method was required that would allow observations of more than single gestures (as suggested in chapters 1 and 3) so that *ensembles* of gestural action could be described and that would also allow gesture types and targets to be identified. It also needed to identify the task context in which the gesturing and targeting took place as the group(ed) pupils completed their activity. The actual settings in which observations were ultimately made were therefore an issue.

The author had been involved in data gathering for a larger project (the CASE @ KS1 Project – Adey et al 2001; 2002) which was working with year 1 pupils and their teachers in a group of local authority primary schools. This larger study employed a quasi-experimental approach. It involved a comparison between two sets of schools. One set of schools used externally produced cognitive development activities, in the form of teacher-led and managed group based tasks in a science context. The second set of schools used conventional teacher produced tasks in the same curriculum context. This second group of classes were ones where such integrated group activities were *not* undertaken and in which teacher-led group work of this sort was not practised.

The teacher-led (TIG) tasks had cognitive development goals. In addition, as a result of the way in which teachers were to manage the tasks in practice, the same task necessarily involved pupils in developing their group interactional skills. Elements of developing turn taking, listening to others and explaining their reasoning featured in early parts of the programme in the activities expereinced by pupils in the classroom. These were intended to support later, group based, activity. This type of training, it was hoped, would facilitate group interactions. From the point of view of the current study it would also, it was hoped, support interpersonal and gestural activity. These tasks, and the development of group interaction skills, would offer contexts in which gestural activity was permitted (as interaction was necessarily involved), increasing the likelihood of its being detectable by an observer.

From the point of view of the current study this would contribute to a heightening of contrast between the two settings. The group(ed) pupils with a teacher in the group could be expected to interact to a greater extent than where pupils had only to interact with the teacher for help and resources and with their peers to gain access to resources. Using schools participating in the CASE approach also meant that the tasks, as interventions in a quasi-experimental sense, offered teacher-led activities in which the teacher and the activity were fully integrated. These group based activities were of extended duration (between 20 and 30 minutes). They were also based on the same topics and content as were to be used in the schools not using the group tasks, further supporting the ecological validity of the anticipated comparisons.

The two types of teacher and pupil working contexts, outlined at the beginning of this chapter as the setting in which the study was to take place, were realised in practice, by using the two settings available in the CASE study programme. The first was one in which the teacher was out of the group for most of the task and in which pupils may have worked with a partner but usually worked on their own (a setting typical of many primary year 1 classrooms as suggested in the

literature review) – the **TOG setting** (using schools involved in the 'control' part of the CASE programme). The second setting in then study, used the CASE study intervention programme schools, and represented classrooms where the teacher was a collaborating member of the group – the **TIG setting**.

4.2.5 Tasks in the TOG and TIG settings

The TIG tasks began at the beginning of year one and continued through the year (the CASE program constituted an academic year's worth of lesson activity). The participating pupils thus experienced them as a 'normal' part of their year one learning. They were, in addition, a consistent part of their learning context (just as the normal classroom tasks in the TOG setting were part of *their* normal Year 1 curriculum).

All the children in the TIG classes were involved in the CASE activities over the course of a working week, with different pupils experiencing the same task working with their teacher, while other pupils carried on with other work. They could be observed in the working classroom affording maximum ecological validity. Moreover, as all the pupils were, in any particular week of observation, engaging in the same activity, the teacher, task and context would be similar. The pupil composition of groups, being different, would allow observation of particular teacher–pupil and pupil-peer interactions 'controlled' for setting and task within a particular group. These observations could then be compared with those in the TOG setting who would all be experiencing the same pattern of contact with their teacher and in which such large group activities were not being used.

In addition, the ethical issue of not disadvantaging one group over another by using a potentially beneficial intervention for the one but not the other was avoided. All the children in the TIG setting were experiencing the same opportunity to work with their teacher in a particular way. Those in the TOG setting were also experiencing what, for them, was their normal learning practices and experiences. Further, groups in both settings would be undertaking their work in the working classroom. Disruption of their learning (such as might be occasioned by removing them or their teacher from the classroom for observation) would be minimised.

Four schools were identified from the schools involved in the larger project. Among these schools, two were using the TIG approach; two were using the TOG approach. One school in each of these two contexts had two forms of entry at Year 1 and one school had one form of entry. Thus six classes, three in each side of the comparison, were potentially available. This meant that comparisons could be made between TIG and TOG schools. All the selected schools employed mixed ability teaching of mixed gender groups, where possible. All were from the same inner London local authority with a similar multiethnic and socio-economic background.

The grouping practices within the schools also had points in common that further supported the experimental design. All employed seating and grouping arrangements of up to six pupils seated around a common table for pupil tasks; all used the grouped table as a resource focus for a particular activity, so that pupil movement around the class during a task was minimised. Thus observation around the table was facilitated in relation to the task, as the interactions were based around the table, rather than distributed around the room.

The author's role in the project referred to earlier, from which the schools featuring in this study were drawn, involved data gathering with pupils shortly

after they had joined their respective schools. This involved a number of visits during the first term of their year one experience and so the author constituted, to varying degrees, a familiar figure in each of the classrooms involved in the study. All the classes had other adults working in the room, although, as will be discussed later, these were predominantly female (only one other male was evident as a consistent presence in any of the classrooms in the study).

4.2.6 Arranging the observations

Arrangements for observation in the school in the larger project were made with the help of a local education authority (LEA) Inspector-researcher[1]. She had been attached to the CASE project, and handled negotiations with individual schools. She approached participating schools in the first instance, as part of her overall project management role. Planning visits by the author followed up these initial contacts.

Each school had science related curriculum work on different days with some being in the morning and some in the afternoon. The schedule of intended observations had to be created so as to match this pattern. The observation programme had to allow for a number of factors. Available observation 'slots' when pupils would be working on their science work was one. The timing of lessons was a second. The intervention of other school-based activities (the observations were to take place over a six month period) was a third. This last factor altered particular patterns of teaching, sometimes unpredictably. Together these various factors shaped the overall pattern of observations.

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[1] Ms. Anne Robertson, whose help and support are gratefully acknowledged.

The choice of observations could not therefore be randomised. It was, on the other hand, beyond the specification of the observer who had no influence on when particular schools/classrooms would be observed. Equally, the timing and day during the week when a particular classroom was available for observation effectively selected a particular group for observation. It was intended to observe the same group on successive occasions. As two groups were to be observed in each class this meant that the groups that were met on the first observation and second observation respectively became, and specified, the groups to be observed on subsequent occasions.

The task being carried out in the TIG classrooms rotated round all the classroom groups in the course of a week so that the two groups to be observed in each week would be doing the same task. In the case of the TOG classrooms, on the other hand, all pupils were doing the same tasks in the course of a week but might do different tasks on different days. This meant that in the TOG setting tasks could not be guaranteed to be the same for both groups as they were to be observed on different days. On first visiting the class any of the groups could have been chosen for observation. Each TOG classroom group was therefore given a number and lots drawn to identify those to be observed. They also became the observed groups for the period of the study.

Groups in each setting were defined in terms of the types of task they were to undertake which incorporated the role of the teacher. The TIG tasks took the form of the teacher giving a verbal introduction to the tasks (the pupils concerned could not read at this stage, so could not follow written instructions); organising the group's activity; structuring the pupils' responses; acting as a resource for planning and discussion elements; acting as a 'referee' for interactions. The tasks themselves had been developed by the CASE team and thus arose outside the classroom.

Teachers had been trained[2], in the theory and process of the tasks and their classroom implementation, through a programme of consultation based in-service professional development (discussed as a particular approach to professional development in Adey et al (2004 p17-50). Teachers in the TIG context were intimately a part of the group task but had also had training unavailable to the TOG teachers. This may have meant that this training was a possible co-factor influencing any differences between the two settings[3]. This should be borne in mind in what follows and is referred to again in chapters 5 and 6.

In contrast, the TOG groups were experiencing a task that also had teacher input, but had been created in that particular school. In this case the task was of the teacher's choosing and was introduced to pupils verbally, as a whole class, rather than as a small group. The teacher monitored it from a distance. She did not, however, structure or supervise the moment-by-moment engagement with the task as the teacher in the TIG setting did. Thus the interactions in the TOG setting involved predominantly pupil-peer interactions in the context of the task; those in the TIG setting involved teacher mediated pupil-peer interactions.

The teachers involved were effectively chosen by the selection of particular schools. This was done on the basis that the schools concerned were not being used for other specific research.

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[2] Teachers involved in this programme experienced a number of Professional Development Days to introduce them to the materials to be used with their groups. On at least one of these days, managing classroom groups was discussed. This could have alerted the teachers to such issues in a way not available to the teachers working in the TOG setting. In addition, TIG teachers worked through a small number of the pupil tasks as participants in a task group. This could have further emphasised interactions in a group in a way not open to the TOG teachers. It is thus possible that teacher experience of managing groups and tasks in a group would have been increased for the TIG teachers and not the TOG teachers. It could thus have become a possible co-factor affecting differences between the groups.

[3] This may not have been recognised as such by the TIG teachers themselves: they, and their TOG counterparts, did not identify having experienced any such training in response to Q11-14 in the post-observation interviews relating to training in working with groups. (see Interview questionnaire in Appendix 5).

The observations of the two groups in each class were scheduled to be made at regular intervals over the spring and summer terms, allowing a relatively large corpus of grouped task observations to be accumulated for statistical purposes. This analysis was to be at the grouped level rather than at the level of the individual participant in a particular group.

Two groups of pupils identified in each class, became the focus of group observations in a particular classroom over the course of the observation period. The study started out with two groups of six children from each class, giving twelve pupil groups and 72 pupils as the research sample. Six teachers were to be involved.

Experience from the researcher's former work as a classroom teacher suggested, however, that, with pupil absences, illness, transfers to other schools, family arrangements, etc, it was unlikely that particular groups *would* remain the same (see section 4.5.8 following). In addition, the teacher might need to move pupils, from or into, the group for classroom management reasons usually to do with social relations between particular children.

As the researcher was a guest in the observed classrooms these challenges to group organisation and consistency were necessarily accepted. As will be seen this had a number of consequences not only for the extent that planned observations actually took place, but also for the extent to which groups had the same participants on successive occasions and thus were, realistically, the same.

4.3 Participant characteristics

Arrangements for access to schools and their participants, negotiations with head teachers and their staff were arranged through the LEA officer referred to earlier. Institutional and participant permit was on the basis of a school volunteering to take part in the project, with the agreement of their teaching staff. Parental permit for the participation of their children was arranged through the LEA and individual schools.

4.3.1 The Schools

Four primary schools were initially identified. All had similar socio-economic, ethnic and gender mix patterns. They also had a similar pattern of abilities and social interaction behaviours as revealed by common baseline assessments.

One of the TOG schools had two forms of entry, the other, one form of entry. The same was true of the TIG schools. However, as will be reported later (see section 4.5.7) observations in two of the schools (one in each setting) were incompatible with those of the other classrooms. Results from these observations were excluded from the data reported in chapter 5.

As a result this study reports data from two schools only. The TOG school with two forms of entry and the TIG school with two forms of entry. The two TOG classes were labelled TOG1 (N = 29) and TOG2 (N = 28). Those in the TIG school were labelled TIG1 (N = 18) and TIG2 (N = 26). Two groups of pupils were attended to in each classroom. Those groups in classroom TOG1 were labelled TOG1a and TOG1b; those in classroom TOG2 were labelled TOG2a

and TOG2b. Similarly the groups in the two TIG classrooms (TIG1 and TIG2) were labelled as TIG1a and b and TIG2a and b, respectively.

4.3.2 The Teachers

All the teachers were graduates, female and self identified as white. Their ages and curriculum background varied. All were working in maintained Local Authority primary schools and, as revealed in subsequent teacher interviews, had made a positive choice to teach in an inner city, multi-racial, multi-ethnic context. All were highly motivated and committed teachers. None of the teachers reported having received any specific or general training in their pre-qualification courses or post-qualification professional development in respect of gesture use, body language or gesture as an element of communication. This included the teacher whose original training was in drama.

They also reported that they had not, in their recollection, received specific training in the teaching and management of small groups as a task based context. Neither was this a theme that had featured in their post qualification experience. None of the teachers reported any specific training in classroom management that would allow them to work exclusively with a group.

4.3.3 The Pupils

Initial pupil characteristics such as gender, age, parent/carer self-identification of ethnicity, etc. were provided by the local education authority, which also routinely

gathered (and made available for this study) base line data[4] relating to pupils' underlying literacy, numeracy and social development. It was made available on the basis that it would be anonymised when used in the study. For the purposes of this study, pupil data in the following areas was used.

- Pupil date of birth.
- Pupil age at the time of observation.
- Pupil gender.
- Pupil name (to which was allocated a false name to conceal their identities)

The mean age of all the participating pupils was 5 years 10 months (70 months) at 1st February 2000, when observations began (Range 5y4m-6y4m, distribution was multi-modal with a median value of 5 years 9 months. *SD* = 3.71).

4.4 Data gathering strategies

The focus of the study lay in the interactions between individuals as group(ed) participants in the course of particular activities. The principle mode of investigation was therefore observational. However, the observer was not participating as a group member in the task being observed.

4.4.1 Observational focus of the study

In the current study, gestures were viewed as *behaviours manifest as activities or actions,* consistent with the definition given in chapter 3. It was assumed that particular gestures or sequences of gestures (ensembles) might have associated

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[4] The baseline assessment package used was that developed by Birmingham LEA and the NFER (1995).

meanings for others. Gestural activity by one person might be apparent to another person but unless it was *apprehended* as being specifically directed to them, might be noticed but not attended to because it was not viewed as significant for them. So while a participant or observer might notice the behaviours being produced they might only identify them as being directed at a particular target (themselves included) if the nature of the gesture had an apparent referential element. A person might smile without any referencing gaze or lean forward. The smile (or other gesture or activity) might relate to some inner state of the person making it but its significance or relatedness to an external event or person would be unknown to another person (in the absence of any speech or other mode of communication between them) and may have been self directed or accidental. On the other hand, if a person gazed at another, smiled and leant forward, the person receiving those gestures might reasonably infer that they were meant for them (as suggested by the gaze and leaning forward). All these possibilities would manifest themselves in particular actions or behaviours. Their intentionality could only be inferred from their *apparent* directness, from an observer's point of view, but this directedness could, in turn, be an inference and not what the person producing it had been aware of or intended. This is discussed further in chapter 6.

The observational method employed thus focused only on gestures targeted at others or the materials involved in the task, i.e. within the group, being observed. It excluded received gestures because identifying that a target had received a gesture was problematic unless the target showed some recognition or awareness of the gesture having been received. A non-reaction to a targeted gesture need not imply that it had gone unnoticed.

4.4.2 Observing pupil groups: video or participant observer?

Video film was not used in the current study because it was found, in early trials, that when the pupils were working in small groups, with or without their teacher, they tended to huddle close together and, if the materials were on a table, to lean over to look more closely and handle the materials in use. This meant that videoing their faces, for gestural behaviour, was particularly difficult with, in addition, very variable sound quality. Furthermore, a video camera gave little peripheral information about events outside the focus of its view and was necessarily uni-directional.

This could have been remedied by using two cameras which, as there was only one observer available, would have meant that one of the cameras would have had to be 'fixed'. This camera would have been unable to focus on the children's faces when they leant forward or moved away from the table - movements which prior observation suggested were rapid and erratic in direction. Using a hand held video camera offered some potential but would only have been useful in this context if used at the table with the observer plus camera as part of the group. This was found to be intrusive: one measure of this being the extent to which children referred to the camera either verbally or by looking at it. The levels of such referencing were high even after it had been tried over a number of visits and the timescale of the study did not permit a lengthy period of acclimatisation (as in Pollard's studies of the primary classroom e.g. 1996 and Pollard and Filer, 1999). However, video film taken at the time was used for inter-rating purposes, as discussed later.

To capture anticipated interactions a systematic, time based approach was used which still allowed for particular events, outside the time based observation sequence, to be noted. A purely event based observation schedule would not have captured the extent of every participant's activity – and inactivity. An

approach was developed using a system of tape recorders synchronised by time. This also involved audio taping pupils' conversations as they worked in the group with or without their teacher.

Trials of this observing and recording method were made during the piloting phase with a friend's children (with the parent's permit) who were of the same age as the target population in this study. From these initial explorations, and in the light of discussion with supervisors, trials in a classroom similar to those used in the study were undertaken. The researcher, working with two groups of children, was subsequently observed by one of the study's supervisors (Dr. Leo)[5].

The class teacher and children involved in these pilot studies also contributed their own points of view, particularly about the extent to which it disrupted their normal activities. The first data gathering observations in each school were used to monitor the impact of the technique on the pupils. As a result the technique just described (or research 'instrument') was then used, largely unchanged, for the subsequent observations.

4.4.3 Development of each instrument

The initial development of instruments focused on how observations were to be made. This involved identifying ways of:

- Observing and noting the types of gestures being made and whether particular spatial locations permitted more or less gestural activity;

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[5] The Supervisor at that time (2000) was Dr. (now Professor) Elizabeth Leo who moved to another institution following the award of her Professorship. She was replaced by Dr. Jenny Corbett who retired in 2002. She was, in turn, replaced by Professor Peter Blatchford and Professor Julie Dockrell.

- How teachers used the classroom space, and in particular how they approached the tables where pupils were working;
- Mapping classroom layout to record group position in the room, proximity of other groups and resource locations.

The initial observations relating to gesture use were gathered by watching pupils at their tables, working on various tasks. These observations were consolidated into gesture categories, which informed the observation protocol shortly to be described. The categories were those relating to:

- Facial expression;
- Head movements;
- Upper trunk movements;
- Limb based movements;
- Whole body movements;
- Directed gaze (to people and objects);
- Handing and handling behaviours.

The grouped activities that were subsequently observed took place at the pupils' normal worktables. Participants remained seated, or, if they stood, remained in close proximity to the table in both TOG and TIG settings. However, in the former, the teacher periodically arrived at the group table and then left. Her kinesic behaviours associated with walking were not noted. Neither were similar gestures noted for the teacher in the TIG setting if, as happened from time to time, she briefly rose to leave the group. Again if pupils left or arrived at the table, their kinesic gestures in getting to the table or leaving it were not noted. The focus of gestural observation in both settings was based on the participants being *seated* for the activity. These had a number of consequences when some

of the groups started working on the floor rather than the table (see section 4.5.7).

The majority of kinesic gestures involving body movement therefore focused on the upper body, upper limbs and head. As a result of this approach, some of the task observations made in the study were not reported in the study. These were ones, which involved pupils moving from the table context to work on the floor or classroom carpet area. These different locations and body positions permitted a wider range of gestures than was the case for the table-based work. As a result they were not compatible with those made in the Table based work setting. This is discussed further in subsequent sections.

4.4.4 The categories used in the observation system

Observations made in classrooms in the initial phases of the study identified a range of individual gestures. Pupils and teacher used these alike. When informed by the literature reviewed in chapter 3 a number of more specific categories of individual gestures suggested themselves. As the observational technique involved the recording of an *observation narrative* of the observed gestural activity of participants, it was felt necessary, given the constraint of selective attention, to identify particular categories of gesture that could be particularly attended to.

Bearing in mind the work of Kendon (e.g. 1978, among others) cited at the beginning of chapter 3, it was decided to use changes in gestural 'state', that is where a participant showed a marked deviation (an 'excursion') from their current gestural activity, as a basic unit of classification. It also prompted, when recording was in progress, the inclusion of a gestural observation in the

narrative. This use of deviations from an existing gestural state suggested the need for a default state for each gesture type. Having moved away from a particular gestural state, neutral face to smile, for example, a return state would also be needed, smile to neutral state. This implied a tripartite categorisation for each gesture type.

The schedule of these states is listed in Figures 4.01 and 4.02 below. A neutral state for each gesture type formed the core of the gesture observation protocol. Departures from each gesture neutral state could be commented upon in the narrative with minimum use of words. This schedule of neutral states was memorised by the observer to aid attention during observations. This exploited an underlying human orientation towards the observation of others' gestural behaviour as noted in the literature review in chapter 3. It utilised an already noted phenomenon and systematised it by the use of the observation schedule.

Observational 'codings' as spoken, were based on a memorised schedule of eight categories of basic facial and postural gestures, as shown in the table below. These were grouped in patterns of three (a horizontal row in Figures 4.01 and 4.02) representing the neutral or default state and two associated dimensions of change away from that state (the non-expression of a behaviour was treated as a default position i.e. the middle column).

The significance of these various gestures in an interpretative sense was not assumed at this stage. Rather their inclusion was based on their being widely observed prior to the study. The layout of the table reflects a need both to minimise the number of dimensions of the categories being observed for manageability reasons, on the one hand, and to have a consistent basis for deciding that a gesture had been made as a distinct change, on the other. So that, for example, a pupil sitting upright was taken as being in the default position

Figure 4.01: Observational Gesture types: default and change descriptions.

Description of gesture		
Change 1	Default position	Change 2
	Face	
Smile	No expression	Frown
Eyebrows raised	Eyebrows horizontal	Eyebrows lowered
	Head movements	
Nod-of-head: up, down	Head still	Shake-of-head: side to side
Head turned to left	Head facing ahead	Head turned to right
Head leaning back	Head held horizontal	Head leaning back.
	Gaze	
Gaze to left	Gaze ahead	Gaze to right
Gaze upwards	Gaze ahead	Gaze downwards
	Upper trunk	
Leaning to left	Upright in seated place	Leaning to right
Leaning back	Upright in seated place	Leaning forward
Turning to left	No turning to either side	Turning to right
Turning around to the left (swivelling in seat)	No turning to either side	Turning around to the right (swivelling in seat)
	Arm	
Arm moving upwards	Arm at table level: still	Arm moving downwards
Arm moving left	Arm at side: still	Arm moving right
Arm moving back	Arm at side: still	Arm moving forward

Figure 4.02. Observational Gesture types: default and change descriptions, contd.

Description of gesture		
Change 1	Default position	Change 2
	Whole body	
Participant moving to floor	Participant remains in seat	Participant stands
Participant gets up	Participant remains in seat	Participant sits down
	Touch	
Touch upwards	No touching	Touch downwards
Touch to left	No touching	Touch to right
Touch to back	No touching	Touch forwards
Touch to self	No touching	Touch to other
	Combined gestures	
Object handed to other	No handing	Object received from other
Object handed upwards	No handing	Object handed downwards
Object handed to left	No handing	Object handed to right
Object handed backwards	No handing	Object handed forwards

for a forward or backward motion (change in proximity) and a neutral face taken as a default between a smile and frown face (an affective gesture).

To allow identification of particular participants as producers and targets of gestural intent, each was allocated a number which reflected their physical position with respect to the observer. Comments identifying gestures included the number of the person making the gestural move and number of the person being targeted. Where objects were being targeted the name of the object was identified.

To reduce the amount of recorded speech and to allow time to observe each participant in turn, *only non-neutral behaviours* were commented on in the observations, reducing the amount of comment needed for each observation. This also meant that the observation protocol as used in the narrative of observations only recorded *changes* from a notional non-gesturing state.

The need to note unusual gestures (Smith, 1983) was also accommodated. Gestural interactions were noted in terms of who or what the gesture was targeted at, a purpose related criterion as advocated by Smith (1983) and McNeil (1995) and in the classificatory systems of Ekman and Friesen (1969) and Bavelas, (1994).

The visual coding system employed at the transcription stage for the gestural data involved symbols that could be combined to generate new but consistent symbols if additional categories were needed and are discussed later on. The next section describes the observation procedure and how it was applied.

4.4.5 The gesture observation protocol in use

The procedure used to observe the groups' gestural interactions involved a systematic and sequential observation of **each participant in turn** derived from

an interval recording strategy described by Robson (1998 p219) and was implemented in the following steps:

Step 1: The group being observed (seen in 'birds-eye' view at step **1** in Figure 4.03 below) were seated around their worktable. Necessary resources were already on the table ready for participants to use. The observer joined the table after the teacher had seated pupils in the TIG setting and after pupils had taken their places in the TOG setting. The observer sat in an available space, slightly back from the edge of the table. The observer's greater sitting height allowed him to lean forward to examine pupil faces whilst maintaining a fixed distance from the table during the observation.

The recording equipment was deposed around the observer with one tape sending a time cue into the observer's earpiece, while the observer's comments were recorded on a second, synchronised, tape recorder fed through a mouth piece microphone. A separate omni-directional microphone, secured on the work table with 'blu-tak', was used to pick up pupil verbal interactions. This was synchronised with the other tape recorders. All the devices were small, portable and battery powered. Power levels were checked at the beginning of each observation period.

Steps 2 – 5: At the time prompt observations were made of **each group member in turn** using the memorised categories developed earlier (steps **2 - 5** in Figure 4.03) and including the time prompt value itself. Observations started at participant (1), and went successively round the group to participant (7). Each participant was observed once in each observation cycle. In the case of the TIG group, person code '7' was the code for a teacher. The same code was used in both settings. In the TOG setting, the teacher was an intermittent presence: her arrival was noted and commented upon as it occurred. This meant that in this

setting the teacher observation was effectively inserted into the observation sequence of the pupils.

For a group of six pupils and a teacher, the consistent group observation period was 20-seconds (to allow comparison across groups) and meant that each participant was observed on average for approximately 3 seconds in each observation cycle of twenty seconds. However, pupil absences meant that some groups in particular observations had only five members (four pupils and one teacher). In such groups the observation period per pupil was therefore, on average, approximately four seconds. This had implications for the statistical analysis of the results, which are discussed in the next chapter.

The sequence of observations is shown, for one grouping pattern, in stage **4** (Figure 4. 03). If a participant was not making a gesture; that is, they were not departing from the default position against any of the gestures, as described earlier, their lack of activity was not recorded. They had nonetheless *been observed* for the same period as the other participants. A single observation of the whole group, in which each individual participant was observed in turn, lasted for 20-seconds and was marked by a time prompt supplied to the observer's earpiece. Silent counting on the part of the observer (a count of three) was used to give an approximately consistent observation period for each individual participant. As gestures occurred, their apparent directedness (to people, materials or people and materials) during the observation period was identified and whispered into the observer's microphone headset in the order they occurred, creating a narrated record of what was being seen by the observer (step **5,** Figure 4.03).

Step 6: The observation for a particular participant consisted therefore of the targeted gestures they were making during the observation period in the order in which they happened. As such they were a narrative sequence of the observed

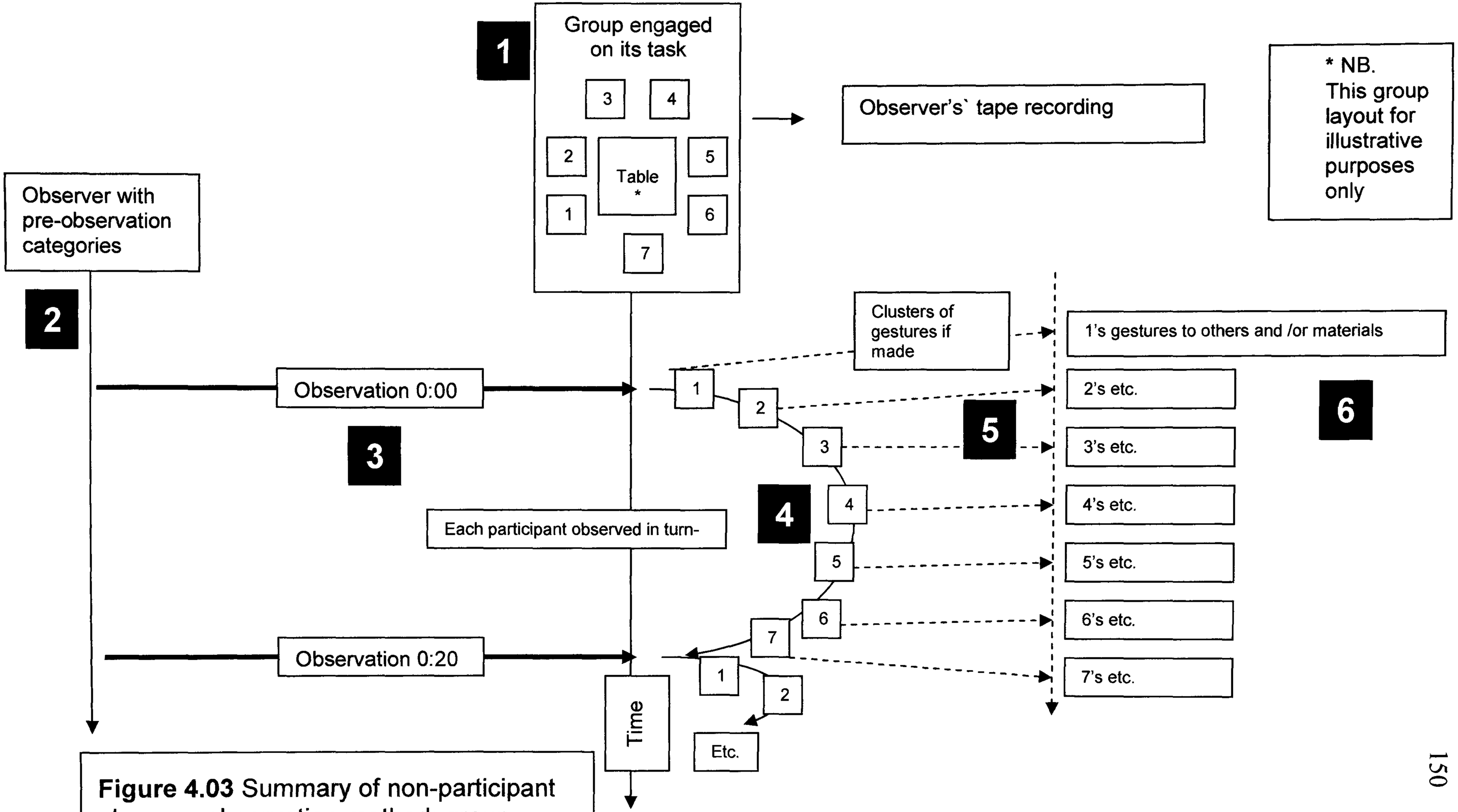


Figure 4.03 Summary of non-participant observer observation method: group activity.

gestures (step **6,** Figure 4.03). At the next time prompt, the narrative cycle of observation began again and continued until the task was completed. Each cycle of observation was therefore a single observation of the whole group, in the course of which, each individual participant was observed once. Observations were therefore of each individual as they worked in the group. As observations were made every 20-seconds the length of the task was counted in terms of the number of 20-second observation periods used. As each participant was observed in each twenty-second cycle, this meant that the number of observations made of each individual participant was the same as the number of twenty-second cycles. The 'raw data' for all the observations, as counts of individual observations by each individual in each group, both TOG and TIG, are given in Appendix 1, along with the total number of observations made of each group. As task length varied (see section 4.5.8), the actual number of observations made varied between tasks. In general there were more observations in the TIG tasks than in the TOG tasks.

4.4.6 Observation of verbal interactions in groups

Observations of verbal interactions within the group were made to support the analysis of the gesture observations emerging from the earlier instrument. They were to be used for reference rather than as a core component of the study itself. The recordings of the observed verbal interactions were time synchronised with the recorder used in the gesture observations. This was achieved by using spoken start stop markers. Tape recorder counters were also synchronised before recording and checked at the end of recording. The gestural and verbal data could thus be linked together at the transcription stage by the use of the common time code.

4.4.7 Inter-rating and transcription

Inter-rating for gestures was undertaken using video recordings made of pupils similar to those involved in the current study. The observer making the observations to be reported in chapter 5 was not himself observed (there were no other researchers involved). Video recording of the groups as they worked, and thus of the observer as he observed the groups, was not made as discussed in section 4.4.2 earlier. A *post hoc* examination of the extent to which the observation method could reliably identify gestures was undertaken.

Five short grouped tasks, captured with a hand-held video recorder, were used. As the camera was held above and to the side of the group, members of which were leaning inwards, the categories of smiling and frowning could not be reliably captured. It was also possible that head nods and shakes would be lost in forward leaning movements as pupils crowded into the table. For the same reasons joint-gaze would have been difficult to detect. These concerns were consistent with the pre-study reasons for not using video in the actual study. Accordingly a narrower range of categories was used in the inter-rating activity.

The observational method had created a narrative of what was observed. This, once written down, was then analysed into categories. To be amenable to categorisation, it would be necessary to place particular observations in discrete and exclusive categories. Three codes were chosen that might either separately, or in combination, be potentially ambiguous. These were gaze, turning and leaning. As any, or all three, gestures could have co-occurred in a single observation in the observational narrative they could not be put into mutually exclusive categories for the same observation.

Following Bakeman and Gottman's (1997 p72) suggestion, individual agreement statistics were calculated using collapsed agreement matrices by turning the

coding into a yes/no dichotomy for a particular code (so, for example, gaze coded as having occurred in one category and no-gaze in another. Inter-rating assessed the extent to which inter-raters were coding the two possibilities consistently with each other). This approach was used to test agreement on the codes for the three categories: Gaze, Leaning and Turning (detailed statistics are given in Appendix 3, Table 3.01 and 3.02). The mean values for each are summarised in Table 4.01.

Table 4.01 Mean of Cohen's Kappa for three gestures categories, inter-rated by two inter-raters, over five complete tasks.

Variable	Mean *Kappa*
Gaze	**0.74**
Lean	**0.78**
Turn	**0.77**

The second round of inter-rating was undertaken to check the coding of the transcribed gesture observation results. Observations from the gesture recordings were transcribed using a visual code onto a framed format for analysis (see Appendix 2 for codes (Figure 2.02 & 2.03); two blank transcription forms (Figure 2.04 and 2.05) and a page from a completed form (Figure 2.06)). Categorisation for statistical analysis was made on the basis of these transcriptions and so was inter-rated as the observer was transcribing all the observational data and would be doing all of the categorisation. The inter-rating used the transcribed data.

Six of the task observation gestural transcripts were chosen by random number generator to be used in the inter-rating. One hundred observations were taken from each of the identified tasks and independently coded into the mutually exclusive categories for each of the three variables – gesture, gesture-targeting

and task-activity - using the decision trees for each variable (see sections 4.4.1 – 4.4.3 and Appendix 3, Figure 3.01-3.03). Cohen's Kappa was calculated for each variable. Statistical results are shown in Appendix 3 (Table 3.03 & 3.04). The mean values across the six tasks for each variable are shown in Table 4.02 (both sets of inter-rating results are further mentioned in chapter 6).

Table 4.02 Mean of Cohen's Kappa results for inter-rating between two inter-raters, of 100 observations drawn from six different task observations, for the variables shown.

Variable	Mean *Kappa*
Gesture-use	**0.81**
Gesture-targets	**0.76**
Task-activity	**0.83**

Transcription of the audio-tapes was initially by listening to the tapes and noting relevant points. The teacher interviews were listened to in the same way and then fully transcribed.

4.4.8 Contextual data

Two standardised record sheets (see Appendix 4, Figure 4.01 & 4.02) were used to gather contextual data about the classrooms in which the observations were to be made. The first of these focused on the environmental context and was used to record the overall teaching room layout, that is the relative positions of the carpet, tables, whiteboards, entrances, exits and other features. The second focused on the layout of the table used for the group activity, the positions of participants in the group, their gender and names. It was also used to record any changes in location occurring during the task observation. A third part of this

form was used to record information about the weather, wet breaks and other factors that might inform pupil behaviour during the observation period - this was also linked to written field notes recorded in an observation diary.

4.4.9 Whole class observation

Whole class observations, focused on teacher-pupil and pupil-peer verbal interactions, were also made. These were recorded on audiotape via a discrete combination microphone-speaker earpiece and subsequently transcribed as adjuncts to field notes made immediately after the observation. These observations fell into four categories and were those made: during class registration, the period prior to the task observation, observations during whole class instruction giving periods and following task completion and review.

4.4.10 Teacher Interview

At the end of the study each participating teacher agreed to an extended, audiotaped and semi-structured interview (for script see Appendix 5). It addressed contextual issues arising from the observations and gave teachers the opportunity to comment on their experience and to raise any other contextually useful points. The transcript was sent to the participants for comments and any suggestions or amplifications made by them added to the text and coded for analysis. Permission to quote for the purposes of publication was also gained from each participant.

4.4.11 Field notes

Dated field notes were made in the form of a research diary. These were used to record contextual observations. The author's reflections during the research process were also recorded.

4.4.12 Use of instruments

The following instruments were employed, in the fixed order shown, across the data gathering activity:

1. Environmental context;
2. Whole class context;
3. Gestural observation and Verbal observation (group(ed) task);
4. Field Notes.

At the end of the study:

5. Teacher interview.

The next section describes the methods of analysis brought to bear on the data.

4.5 Methodology: analysis of data

4.5.1 Categorisation of gestural data

Following transcription of the gestural data (see Appendix 2 for examples of transcript record sheets (Figures 2.04 and 2.05) and an example of a page of transcript showing a transcribed set of observations, Figure 2.06), empirically

based categories were established by examining observations made at each time point. From this process it emerged that individual observations could be characterised by the appearance of particular sequences of gestures as suggested in the literature review in chapter 3. This led to the creation of four mutually exclusive categories for gestural activity.

The first category was labelled '**Presence**' and described a participant who made no move away from any of the default positions for the previously specified gestures (see Figures 4.01 and 4.02). In this sense it was a 'passive' gesture category. This did not mean, however, that this apparent inactivity on the part of the participant indicated a lack of involvement in the group(ed) activity, as this would still have been available to them via their individual visual and auditory fields. They were thus; it was assumed, sentient of events but not expressing any particular gestural activity.

The second category embraced gesture sequences involving *only* gaze, turning, leaning and rocking gestural changes. This category was labelled '**Looking-on'.** If participants' gestural sequences included, in addition to those of the Looking-on category, those involving changes in joint attention, touching (but not handling), pointing, hand raising or head movements such as nodding or shaking of the head, these were labelled '**Indicative**' sequences – the third category. Finally, if, in addition to the changes associated with the earlier categories, further gestural changes were noted which involved handling, holding, handing-on or exchanges (afforded by the participant standing or sitting) these were classified as '**Intermediary**' sequences – the fourth category (The coding decision tree for gesture is given in Appendix 3, Figure 3.01).

4.5.2 Categorisation of gestural-targets

The gestural observations included data on what or to whom particular gestural activity was targeted. This was categorised into four categories on the basis of the type of targeting observed.

The first of these categories, where no target was apparent, was labelled '**No-targeting**'. This did not automatically overlap with the gesture category of 'Presence', as a person could be looking-on but not targeting people or materials; they could simply be observing the activity of the group(ed). The second category focused on gestures targeted *only* on fellow participants and was labelled '**Targeting-to-People**'. The third focused exclusively on materials and was called '**Targeting-to-Materials**'. The final targeting category covered gestures aimed at participants who were using materials and was called '**Targeting-to-People-and-Materials'** (The coding decision tree for gesture-targeting is given in Appendix 3, Figure 3.02).

4.5.3 Categorisation of task-activity data

The categories used to specify task-activity in each of the group observations was again empirically based and drew on three sources of information. The first of these was the structure of the task as described by the classroom teacher in her lesson planning. As this tended to change when the task was implemented in the working classroom, the second source of information was that derived from observation of the task, itself informed by the tape recording of verbal exchanges during the activity. The third source was the gestural transcripts based on the group observations. These three sources of information were combined. Four

categories that could be used across the tasks in both teacher settings (TOG and TIG) were created.

The first of these categories was one where no task-activity was apparent. This was labelled '**No-Activity**'. The second category encompassed task activity that mostly involved looking at work, materials, other participants (or listening to them) or work of others (including the giving of explanations) and was labelled '**Observing**'. The third category described those participants who were mostly speaking to themselves or other participants or who were directing speech towards materials. This category was called '**Speaking**'. The final category covered those participants who, when observed, were acquiring, using, manipulating, exchanging, transferring or distributing task materials. This category was labelled '**Using-Materials'**. The use of 'mostly' in these descriptors reflected the fact that categorisation was made on the basis of which activity occupied the majority of the period of observation. This was necessary as the participant might be in state of transition, between one activity-type and another, at the time of observation (The coding decision tree for task-activity is given in Appendix 3, figure 3.03).

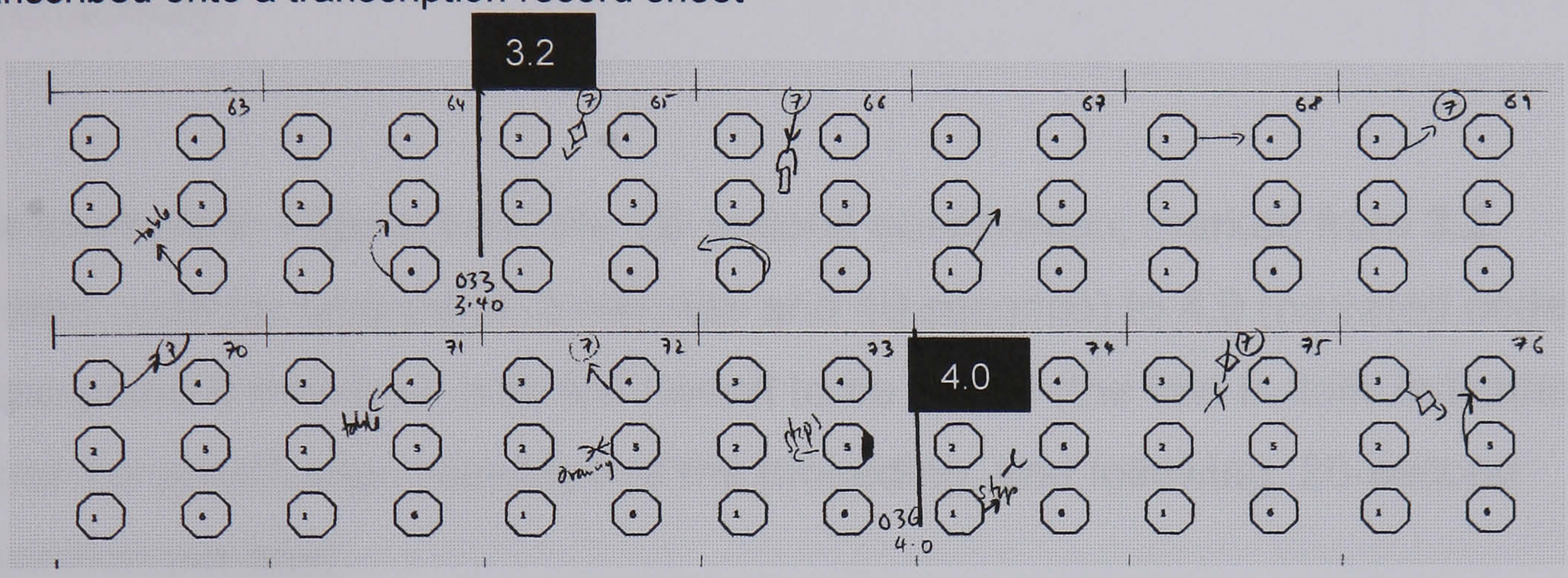
The process of transcription, from narrated observation, through transcription to a record sheet, and then coding, is shown in Figure 4.04, where a 20-second observation cycle is identified and then particular participants' activity coded as illustrative examples. In any one minute of observation of a group there could be three cycles of 20-seconds of observation. These observation periods were identified, for narrative purposes, and to save time, as: first, the number of the minute itself e.g. observation begun at 3 minutes, spoken '3.0'; the second observation period as 'point 1' e.g. spoken 3.1 (3 minutes 20-seconds), and the third observation period as 'point 2' e.g. spoken 3.2 (3 minutes, 40 seconds).

Figure 4.04 Summary of transcription process with examples of coding.

1) Narrated observation (from audiotape):

> *…6 looks table, work, looks at 5,* **3.2,** 7 looks at group, speaks, 1 turns left, looks back, down work, 7 puts materials, table (2)…, 3 looks at 4, looks at 7, twice, 4 looks at table work, looks at 7, 5 draws crayon, looks work, looks down work, leans back, (6)…, **4.0**, 1 *reaches crayon, stops, (2)…, 7 speaks, hands materials to table, 3 look at 5, speaks, (4)…, 5 looking at 6…*[6]

2) Transcribed onto a transcription record sheet[7]



3) Examples of participant coding in a 20-second observation period from 3.2 (3 minutes 40 seconds) to 4.0 (4 minutes):

Participant 1 (a pupil):

Gestures:

-Turning, looking back and looking down. From section 4.5.1, coded as '*Looking-on'.*

Targeting:

-Looking down at the table, and, at her work. No targeting of people involved so, from section 4.5.2, coded as '*Targeting-to-Materials'.*

Task-activity:

-Mostly, looking at her work. From section 4.5.3, coded as '*Observing'* (not coded as 'Using-materials because there was no direct physical manipulation of her work or other materials).

Participant 7 (a teacher):

Participant activity was only counted, for coding purposes, when they were the focus of observation (frame 65 in the transcript) in each 20-second observation cycle. Seven's co-occurring activity in frame 66, when (1) was being observed, was thus not counted for (7).

Gestures:

-Looking at the group. From section 4.5.1, coded as *Looking-on.*

Targeting:

-Only to pupils in the group. From section 4.5.2, coded as *Targeting-to-People.*

Task-activity:

-'Looking' when 'speaking'. The criteria, described in Section 4.5.3, required the majority activity to be used for coding. The looking necessarily occurred as the teacher spoke to the group (she was addressing the group as a whole). From section 4.5.3, coded as '*Speaking'.*

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[6] Narrated observation (from audiotape) excerpt: frames 63-76: co-1-b-1-1-17;2).

[7] See Appendix 3 for examples of transcript record sheets (Figures 3.03 and 3.04), an example of a page of transcript showing a transcribed set of observations, Figure 3.05. and coding decision trees, Figures 3.06-3.08)

In the narration transcript '...,' represented a distinct pause in the narration (the participant number, seen in the figure e.g. (2...,) has been added to aid the reader – it was not mentioned in the actual narration) and indicated an observation of a participant in which no gestures, targeting or task-activity was apparent (recall from preceding sections (4.5.1, 4.5.2, 4.5.3), that if a participant was not active. their lack of activity was not referred to, thus saving narrative time). This would have been coded, respectively as 'Presence, No-Targeting and No-activity'.

In the example in Figure 4.04, the 20-second observation, marked from **3.2** (narrated code for time-point, 3 minutes and 40 seconds) to **4.0** (narrated code for time-point, 4 minutes), was the period to be coded (the text in italic indicates parts of the observation narration of the preceding, and following, 20-second observation periods).

As this example is from a TOG setting, the teacher's interventions were observed as, and when they happened, as noted earlier (in the TIG setting, teachers were observed in sequence with other participants). Observation of pupils, each in turn, round the group, then followed. Two specific examples are given for illustrative purposes. Each participant in the group (including the teacher) was observed only once in the 20-second cycle.

Example one, concerns a pupil (1): her gestural activity consisted of; turning, looking back and looking down. From section 4.5.1, this would have been coded as '**Looking-on'**. Her targeting only involved her looking down at the table and at her work. From section 4.5.2, this targeting was only focused on work, and thus task materials, and so was coded as '**Targeting-to-Materials'**. In terms of pupil 1's task-activity (section 4.5.3), she was mostly looking at her work and so was coded as '**Observing**' (her looking out side the group was not counted, as it was not possible to know, reliably, what, or who, she was looking at). She was not

coded as 'Using-materials because there was no direct physical manipulation of her work or other materials.

As a second example, the teacher's (7) gestures were: looking at the group, handling, holding, and handing-on to the table. From Section 4.5.1 this might appear to be more than Looking-on as it involved Intermediary gestures. However, in this instance, the teachers' handling of materials did not occur when they were being observed (they had been observed already in the cycle) but was noted when another participant was being observed (participant 1). This was therefore disregarded when coding the teacher's activity. Her activity was thus that of 'looking' and 'speaking' to the group. This was coded as '**Looking-on**'. On this basis her targeting was to the group only, so from section 4.5.2, she was targeting people and so was coded as '**Targeting-to-People'.** Following the same logic, her task-activity involved. 'looking' when 'speaking' .The criteria, described in Section 4.5.3, required the majority activity to be used for coding purposes. In this instance, the looking necessarily occurred as the teacher spoke to the group (she was addressing the group as a whole); her main activity was regarded as 'Speaking', and so she was coded as '**Speaking**' for her task-activity.

Where other events occurred (here, teacher (7) activity), as a particular participant was being observed (pupil 1 in this instance), they were noted, as they might have had interpretative implications. The decision trees used in the actual categorisation of transcript data for gestures are given in Appendix 3 (Figure 3.01 – 3.02) as are related inter-rating results for inter-rating of the transcribing / categorisation process (also see section 4.4.7).

4.5.4 Defining observation counts

The gesture-use, gesture-targeting and task-activity for each individual participant, in each twenty second observation period, within a particular task, was categorised according to the descriptions just given. As the tasks were of different durations and so afforded opportunities for a different number of observations (see Appendix 1), and given the nature of the observations (to be discussed shortly), individual observations (counts) in a particular task, for a particular category, were totalised and divided by the total number of observations made of them in that task. So an individual's total count in a category was expressed as a proportion of their total observations in the task. As a result the data used in the current study is proportional in nature, rather than in the form of raw counts or frequencies. This proportion was converted to a percentage. By using a proportion in this way, variation between tasks, due to different task length (and so the number of observations of the group and thus the individuals in the group) were compensated for.

As sections 4.5.6 and 4.5.8 will shortly explain, multiple observations of the same groups often involved multiple observations of the same individual in different successive groups. This would have meant, when ANOVA procedures were used in the statistical analysis that particular participants would be contributing more than one data set to the same calculation, in breach of one of the assumptions of such tests. However, as the analysis was to be made at the *group* level, girls' and boys' individual proportional counts were to be averaged among each type of pupil to produce a mean value for the 'average girl' and 'average boy' in a particular group. It is in this sense that this thesis will describe participants as 'girls' or 'boys' when discussing the results in chapter 5.

The averaging process referred to above, also compensated for the variation in the number of girls and boys in a particular group (the groups were in working

classrooms where pupils were sometimes away or had to be moved from one group to another for classroom management reasons by the teacher). Groups were therefore not of a consistent composition (see section 4.5.8). This raised a number of issues for the statistical analyses to be discussed in chapter 5). The average of the individual counts for girls and boys in a particular group were designated as the 'mean percentage count (M%C)' for girls and 'mean percentage count (M%C) for boys. As there was only one teacher involved with each group, her results (all the teachers were female) were not averaged, and so were designated as 'percentage counts (%C). It was the 'M%C's for the girls and boys respectively, and the '%C' for teachers, that were averaged across groups, in the TOG or TIG setting and used in the 2-way, between groups ANOVA procedures to be reported in chapter 5. The numerical data presented in chapter 5 is therefore in the form of the mean percentage count (M%C) for girls and boys, and the actual percentage count (%C) for their teacher, in each of the categories, for each of the observational variables - gesture, targeting and task-activity, in a particular task group.

4.5.5 Variables to be reported in chapter 5

The literature review given in chapter 3 pointed to the group setting as being characterised in a variety of ways. In anticipation of this a number of variables were identified and these are reflected in the data presented in chapter 5.

The first variable was the setting in which the groups worked as defined by the role of the teacher in the type of task being undertaken. For this variable, '**teacher setting**', two categories were to be used - TOG and TIG, as defined earlier. A second variable was that of '**type of participant**': teacher, girl pupil and boy pupil (as all the teachers were female, teacher gender was not a variable).

A feature of many of the tasks was the nature of the working arrangements required by the task itself. Both in the TOG and TIG setting pupils often, but not always, worked with a partner. In the TIG setting this was also the case when the group was notionally working as a whole group. In practice pupils worked as partners within the larger group. The last group(ed) variable was thus that of whether or not partnering was a feature of the group and was referred to as '**partnering'.** Two categories were used: partnering and no-partnering. Note that this variable did not relate to *who* was partnering *whom*, as the teachers, in both settings, TOG and TIG, were not partnering any pupils.

4.5.6 Group characteristics

The identification of these variables, at the group level, led to the adoption of a particular view of the group outcomes as data. Although four task observations were to be made of each classroom group specified in the research design, it was recognised that, as a result of the anticipated variation in the variables just described, the groups would be more properly regarded as ***different*** groups. That is repeated observations of a particular group would be observations of the 'same' group in name only.

Further, a number of factors could influence a group. There might be a reduction of group size. The teacher for classroom management reasons might substitute one pupil for another. This would maintain the group size, but different children would be in the group. It was thus possible that ostensibly similar groups might differ further.

In fact, a combination of these apparently slight changes meant that none of the groups, particularly when tasks were taken into account, were the same on successive observations. They were therefore treated as independent groups for the purpose of analysis as all the variables identified were ones that might have a bearing on gestural activity. This was either because they might alter the number of potential gestural targets, or because changes in gender or partnering, for example, might privilege particular gestural activities over others. The extent of homogeneity among the observed groups in terms of the variables described in the preceding paragraphs is referred to in section 4.5.8 (and Tables 4.03 and 4.04).

4.5.7 Excluded data and the observations to be reported

As the observations progressed it became apparent that a decision would have to be made about whether or not some of the group(ed) work observations (See also section 4.3.1) should be included in the data to be reported in chapter 5. This arose because of changes in the group activity context in both of the single classroom settings. In both the TOG and TIG classrooms, the groups concerned moved away from their normal *table* work to complete the majority of the task on the carpeted area of the classroom. It meant that some gestures would be unavailable to the participants – they lay, sat on their knees or sat cross-legged – or additional gestures might be possible.

The move away from working at the table described above introduced marked differences between these observations and the majority of those made in the other classrooms. They were excluded from the data, as they were not comparable. As a result the body of observational data reported in chapter 5 was reduced in its extent. It was drawn from only two of the original four participating schools. However, both of these had two forms of entry and so four classrooms

contributed to the data to be presented in chapter 5. The data is therefore based on observations involving four teachers and eight groups of pupils (N = 49), rather than six teachers and twelve groups as originally intended.

4.5.8 Homogeneity of Settings

It was intended to observe each classroom group four times. However, some observations had to be cancelled as a result of teacher illness or changes in a school's schedule made at short notice. The tightness of the schedule usually precluded re-scheduling a missed observation to another day or time. As can be seen below (Tables 4.03 and 4.04) this meant only six observations were made in the TOG1 classroom, three for each group ('a' and 'b'), and seven in the second classroom (TOG2); three of group 'a' and four of group 'b'. In the TIG1 classroom, six observations were made; four with group 'a' and two with group

- 'b': in TIG2, the same pattern applied. In total there were thirteen observations of groups in the TOG setting and twelve in the TIG setting.

The tasks being observed lasted for different amounts of time (they were real classroom tasks rather than standard, experimental, tasks. The longer the task, the more 20-second observation cycles could occur, and so more observations of the group could be made. As each individual participant was observed once in each 20-second cycle, this meant that all participants were observed the same number of times in each task. The number of these individual observations of participants was thus the same as that of the whole group. The number of observations made in each task group is shown in Tables 4.03 and 4.04, for the two settings.

The number of observations made varied between different tasks, in the same Teacher setting (TOG or TIG,) and between the two teacher settings. In general TIG tasks were longer than TOG tasks, and so TIG tasks involved a greater number of observations. Variable task length was compensated for when proportions were used in subsequent calculations (see chapter 5 - the count in a particular category of one of the observation variables – gesture, gesture-targeting, or task-activity, was compared to a participant's total number of observations in that task, producing a proportion, expressed as a percentage of total observations in the task. The number of observations made of each participant, in each task, is shown in Tables 4.03 and 4.04 (the raw data relating to counts in each task is given in Appendix 1).

Tables 4.03 and 4.04 show that, as anticipated, notionally similar groups of pupils, observed successively, varied in at least two group(ed) variables. None of the groups repeated the same task in a particular series of observations so that when task was taken into account, the group varied in at least three variables. On this basis the groups were viewed and analysed as being independent and different for aggregation purposes.

The original research plan anticipated that group size would be consistent between groups and across teacher settings, thus reducing the number of variables and thus sources of variation in the study. However, it was also apparent that group sizes might vary – pupils might be absent for example. This would have offered the opportunity, if it happened to any extent, to compare the observed variables across group sizes.

Of the two settings, the TOG setting involved 13 task observations. Of these, nine involved groups of 6-pupils and four of 5-pupils. Comparison between these would have, on the 5-pupil group side, involved a small sample. Equally, in the TIG setting, among the 12 observations made, three groups involved 4-pupils,

Table 4.03: Summary of TOG group characteristics by group and observation.

Variable	Classroom							
	TOG1				TOG2			
	Observation				Observation			
	1	2	3	4	1	2	3	4
	Group a				Group a			
Group size:	6	5	5	n	6	n	5	6
No. of girls	3	3	2		3		2	3
No. of boys	3	2	3		3		3	3
Participants	s	s	s		s		s	s
Partnering:	✓	✓[a]	✓[a]		×		×	✓
- pairs	c	c	c					f
Seating	p	v	v		p		v	v
Participant observations in task[b]	81	67	25		31		25	19
	Group b				Group b			
Group size:	6	6	6	n	6	6	5	6
No. of girls	3	3	3		3	2	2	3
No. of boys	3	3	3		3	4	3	3
Participants	s	s	s		s	d	d	d
Partnering:	×	×	✓		✓	×	×	✓
- pairs			f		f			c
Seating	p	v	v		p	v	v	v
Participant observations in task[b]	11	36	28		42	31	23	19

Note: n = Observation did not take place. Participants: s = same participants as in first observation, d = different participants to first observation. Partnering: ✓ = partnering used in task, × = partnering not used in task, ✓[a] = one participant did not have a partner. Pairs: f = individuals in first paired observation in this group, c= pairs changed compared to first observation. Seating: p = seating position around table in observation 1, v = participant positions varied compared to observation 1. [b] = number of times *each* individual observed in a particular group task.

Table 4.04: Summary of TIG group characteristics by group and observation.

Variable	Classroom							
	TIG1				TIG2			
	Observation				Observation			
	1	2	3	4	1	2	3	4
	Group a				Group a			
Group size:	6	6	6	6	6	5	4	5
No. of girls	6	6	6	6	2	2	2	2
No. of boys	0	0	0	0	4	3	2	3
Participants	s	s	s	s	s	s	s	s
Partnering:	×	✓	✓	✓	×	✓[a]	×	×
- pairs		c	c	c		f		
Seating	p	v	v	v	p	v	v	v
Participant observations in task[b]	79	60	113	58	85	79	69	73
	Group b				Group b			
Group size:	4	n	n	4	5	n	5	n
No. of girls	2			2	2		2	
No. of boys	2			2	3		3	
Participants	s			f	s		s	
Partnering:	×			✓	×		×	
- pairs				f				
Seating	p			v	p		v	
Participant observations in task[b]	68			55	92		62	

Note: n = No observation. Participants: s = same participants as in first observation, d = different participants to first observation. Partnering: ✓ = partnering used in task, × = partnering not used in task, ✓[a] = one participant did not have a partner. Pairs: f = individuals in first paired observation in this group, c= pairs changed compared to first observation. Seating: p = seating position around table in observation 1, v = participant positions varied compared to observation 1. [b] = number of times *each* individual observed in a particular group task.

four groups, 5-pupils and five groups, 6-pupils. Comparison here would also have involved small samples – comparisons between the two settings would have been of limited usefulness given the lack of 4-pupil groups in the TOG setting. On this basis an analysis of group-size did not seem sensible and indeed could have been mis-leading.

The use of Partnering within tasks occurred in both teacher settings, and was more equally distributed within each setting. Among the TOG groups seven out of thirteen were involved in partnering; among the TIG setting five out of twelve. Comparisons here would be more reasonable both within and between teacher settings. The use of Partnering might mean that partners might direct more gestural activity to each other, as a result of working together, than to the group in general and this might have a detectable effect on their gesture use and targeting. Accordingly, it was decided to report Partnering effects but not to report group-sizes as a variable.

The methodology described in the current chapter produced a range of results in service of the research questions posed in section 4.2 at the beginning of this chapter. Chapter 5 presents the resulting data and its analysis.

Chapter 5

Results and Analysis

Chapter 5

5.1 Introduction

This chapter reports data from the observed groups. For pupils this is based on the mean percentage counts (M%C) for a particular variable category in a particular pupil group. For teachers it is reported as percentage counts (%C) for a particular group (there was only one teacher associated with each pupil group).

Two approaches are used to analyse this data. The first takes means across all the groups in a particular teacher setting (TOG or TIG) and examines them statistically. Here the emphasis is on similarities and differences in average girls', average boys', or teachers' use of particular categories of a particular variable. It is thus an analysis at variable single category level. The second form of analysis looks at the relative levels of each type of variable category and represents these as a 'profile', using a difference of 10 % between values to identify them as different[1]. Each profile reflects the comparative use of each type of variable category in a particular task. These are then examined within and across teacher settings. This approach looks at all the categories – for example all the gestures used across all the gesture categories – in a particular task rather than, as in the first approach, those of just one category. This gave a broader picture of a group's activity.

Using both of the approaches described above, section 5.2 reports the gesture results for the TOG groups followed by those for gesture-targets (section 5.3), and task-activity (section 5.4), in the same teacher setting. Similarly for the TIG setting, section 5.5 reports the results for gestures, section 5.6, for gesture–targets and section 5.7 for task-activity. As the TIG

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[1] This should be viewed as an arbitrary demarcation of difference and is discussed further in section 5.2.4.

results are reported, in each of these sections, the reader's attention is drawn to comparisons with results in the TOG setting. The next section (section 5.8) reports relationships between the three observed variables in the form of a correlation analysis. TOG and TIG settings are also compared. A final section (section 5.9) reports on a sample of eight case studies of individual groups (four from each teacher setting). These are used to shed light on targeting patterns in the groups as a whole and to raise issues of variability in the underlying data.

5.2 TOG gestures

5.2.1 Gesture counts

The mean percentage counts (M%C) for girls and boys and percentage counts (%C) for teachers, for the variable categories relating to gesture in the TOG setting, are given in Table 5.01. To get an overview of the data across all the TOG groups, the mean of the counts for girls, boys (representing the average girl and average boy at the grouped level) and teachers respectively were calculated (data taken from Table 5.01) and used to produce a bar chart (Figure 5.01). From this it was apparent that the mean of the mean counts for girls and boys was very similar for each of the four gesture categories. They were, however, different to those of their teachers. This was the case for each of the gesture categories.

Among the girls and boys, **Presence** (present but not producing any gestures), **Looking-on** (gestures involving gaze, leaning and turning behaviours) and **Intermediary** gestures were at similar levels. However, **Indicative** gestures, which involved joint gaze, pointing, hand raising, facial gestures and headshaking or nodding, were at markedly lower, but similar,

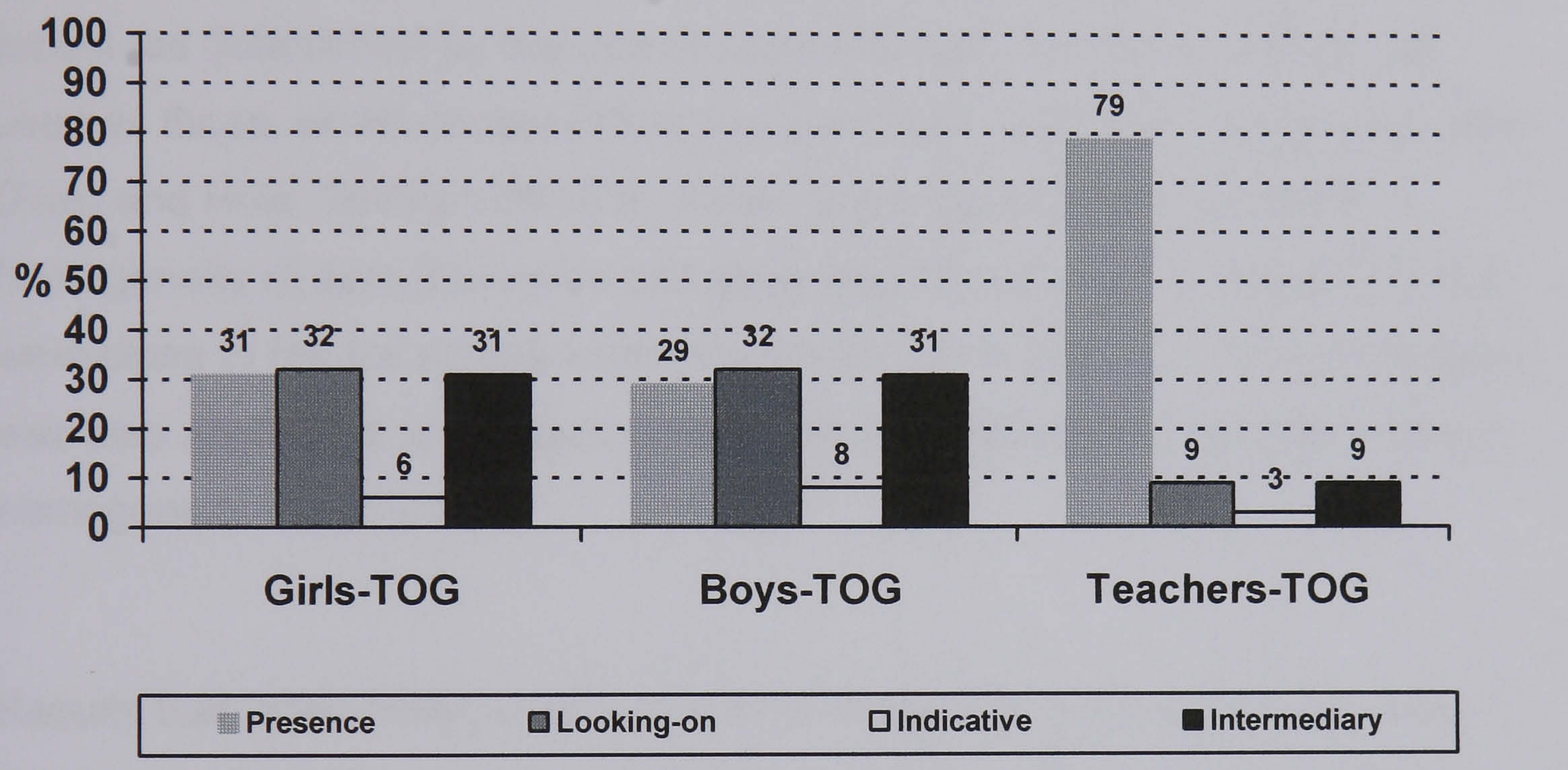
Table 5.01 Mean percentage count (M%C) for girls and boys and Percentage count (%C) for teachers in each gesture category, in each TOG group (N = 13).

	Gesture categories											
	Inactive			Active								
	Presence			Looking-on			Indicative			Intermediary		
Group	g	b	t	g	b	t	g	b	t	g	b	t
Task												
TOG1a												
1	51	33	73	10	17	10	10	14	14	30	36	4
2	37	43	61	10	13	2	11	8	6	41	37	31
3	28	23	96	14	17	0	10	19	4	48	41	0
4	-	-	-	-	-	-	-	-	-	-	-	-
TOG1b												
1	27	15	73	33	49	9	0	3	0	39	33	18
2	33	30	92	20	30	3	7	4	0	41	37	6
3	30	49	93	30	22	7	3	1	0	38	27	0
4	-	-	-	-	-	-	-	-	-	-	-	-
TOG2a												
1	19	33	61	51	43	26	8	11	0	22	13	13
2	-	-	-	-	-	-	-	-	-	-	-	-
3	20	12	100	44	29	0	8	19	0	28	40	0
4	26	26	100	40	25	0	9	14	0	25	35	0
TOG2b												
1	48	41	81	21	18	5	3	5	5	28	42	10
2	57	42	74	21	41	16	5	2	7	18	15	3
3	7	14	70	59	61	22	4	1	0	30	23	9
4	23	19	58	58	55	16	0	3	5	19	23	21
Total	406	380	1032	411	420	116	78	104	41	407	402	115
Groups	13	13	13	13	13	13	13	13	13	13	13	13
Mean[a]	31	29	79	32	32	9	6	8	3	31	31	9

Note: g = Girl pupil; b = Boy pupil; t = Female teacher. **'-'** = No observation took place.
Mean[a] = Arithmetic mean rounded to nearest whole number. All figures rounded to nearest whole count with rounding errors of +/- 1%.

levels for girls and boys. Teachers showed much more Presence than either type of pupil. Teacher's use of Looking-on and Intermediary gestures was at similar levels to each other and was lower than those of the pupils. Indicative gestures were little used by the TOG teachers.

Figure 5.01 Gesture-use in the TOG setting: mean of the mean percentage count (M%C) for girls and boys and mean of the percentage count (%C) for teachers.



Note: There were 13 groups in the TOG setting. Mean counts rounded to nearest whole count with rounding errors of +/- 1%.

5.2.2 ANOVA tests

To explore the data further (and that for targeting and task-activity to be reported later) two-way, between-group, Independent ANOVA tests were performed. These used the M%C counts for girls and boys and the %C count for teachers described above. The two independent variables examined were 'participant type' ('girl pupil', 'boy pupil' and 'female teacher' – see chapter 4) and whether or not partnering was a feature of the task structure (the variable

'Partnering'). The dependent variables in the various ANOVA tests were the categories of gesture (and to be reported shortly, gesture-targets and task-activity). Main and interaction effects were noted in each analysis. All the ANOVA tests were preceded by a test for homogeneity of variance (Levene's Test). As part of the ANOVA procedure, a variety of *post hoc* tests were also used. The ANOVA procedure reveals only differences in the three means being compared and not the combinations of means giving rise to that difference.

Where sample sizes were equal and homogeneity of variance in the data was robust (as determined by the use of Levene's test), Bonferroni tests were used as these, whilst conservative, maintain tight control on Type I error rates (Field and Hole, 2003 p178-183). Where there were doubts about the homogeneity of data (Levene's test gave results that were not significant but were close to the fail criteria level of $p < 0.05$)[2], the Games-Howell procedure was also applied as this approach is markedly less affected by differences in homogeneity of variance.

Results that failed because of a lack of homogeneity were examined using the Games-Howell procedure as well and reported with a cautionary note as to their accuracy. Where this occurred it was most likely to be because one or more of the categories involved had very low levels of variance indeed – much smaller than the other conditions with which it was being compared. Transformation of the data had little effect and so results were reported for the reader to make their own judgement (as recommended by Field and Hole, 2003 p178-183).

Where sample sizes were very different, Hochberg's GT2 was used (this particularly applied to the TIG group data). The post hoc tests used in each set of comparisons were identified in the relevant table of test results to be

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[2] In the following sections, exact *p* values are given where possible. What level of *p* is regarded as significant is a matter of consensus among researchers. Where values just miss significance it is important to know to what extent significance has not been reached. This may affect, for example, which *post hoc* test is used in an ANOVA post hoc analysis.

found in Appendix 6. Where more than one test was applied to a particular set of data this was also stated in the notes of the table concerned and referred to in the text relating to the reported results.

To identify specific comparisons, as made in the *post hoc* tests, and their results, the following abbreviations were used: comparisons between the means for girls and boys were described as 'girls-and-boys', those between girl pupils and teachers, 'girls-and-teachers', and those between boy pupils and teachers, 'boys-and-teachers'.

Each result included the estimated effect size, if a significant result had been observed. Effect sizes for the ANOVA results were based on 'ω^2' (omega squared) as suggested by Field and Hole (2003 p181), with 'ω' (omega) being treated as an estimate of the effect size '*r*'. Field and Hole (2003 p153) based their interpretations of the importance to be attached to a particular effect size on that suggested by Cohen (1988, 1992). These were employed in the current study and were:

- $r = 0.10$ (small effect): explaining 1% of the total variance.
- $r = 0.30$ (medium effect): explaining 9% of the total variance.
- $r = 0.50$ (large effect): explaining 25% of the total variance.

(Field and Hole, 2003 p153)

5.2.3 Two-way, between-groups, Independent ANOVA tests: 'Participant-type' X 'Partnering', for categories of TOG 'Gesture'

In each TOG task group, each individual participant had had a count of being observed in each category of gesture. This was then compared to their total number of individual observations in the task, generating a proportion expressed as a percentage. This percentage reflected the proportion of their total observations allocated into each of the four gesture categories (see chapter 4). The individual percentage counts thus generated were averaged for all the girls in a group and for all the boys in a group to produce an

average percentage count for girls in a group and boys in a group. This was done for each category of gesture (the teacher percentage count was not averaged as there was only one teacher working with each group). These results were shown, for gesture use, in Table 5.01 given earlier. These results were also used in the Two-way, between-groups, Independent ANOVA tests that are reported below. By using these average percentages for girls and boys as representative of the 'average girl' and 'average boy' in a group (the analysis to follow being at the group rather than individual level), each type of participant was only making one contribution to the data set, permitting the use of Two-way, between-groups, Independent ANOVA tests. These tests, using the independent variables, 'Participant-type' and, 'Partnering' and the dependent variable, 'Gesture', for each gesture category are reported[3] in the following sections.

In each test the three means informing the ANOVA calculation (effectively the mean-of-means for girls and boys and the mean for teachers across the 13 TOG task groups[4]) were first tested for homogeneity of variance. Levene's homogeneity-of-variance test (H-o-V) was used in each test.

Looking first at effects for **Presence** as a gesture category, Levene's homogeneity of variance test (H-o-V) was not violated; Presence, $F(5, 33) = 0.44$, $p = 0.815$ (exact 'p' values are used where available from the relevant test). There was a significant main effect of participant type on extent of Presence, $F(2, 33) = 53.39$, $p<0.0005$, with a large effect size, $\omega = 0.90$; (i.e. different types of participant were showing Presence to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and much lower than that of their teachers (girls (g) = 31.92, boys (b) = 29.23 and

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[3] The ANOVA results and associated results are reported in the style suggested by Field and Hole (2003 p191-201) and Field (2000 p310-321) and consistent with the recommendations of the 5th Edition of the Publication Manual of the American Psychological Association (2001).

[4] This use of 'means-of-means' for the pupil results and means for the teachers has implications for variance in the calculations. It can be argued that it effectively compresses or squeezes the variance toward greater homogeneity and makes it difficult to assess the extent to which individual variation affects the results. This is discussed further in subsequent sections and chapter 6, where attempts to examine this issue are reported and discussed.

teachers (t) = 79.38). Bonferroni post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other (*p* = 1.000). There was a non-significant main effect and small effect size for 'Partnering', $F(1, 33) = 1.62$, $p = 0.212$, $\omega = 0.21$ (means; partnering (p) = 49.48 and no-partnering (np) = 43.78) when participant type was not taken into account. Finally, there was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.21$, $p = 0.809$, $\omega = 0$[5]. Overall, teachers showed significantly more Presence in the TOG groups than did their pupils, who, when compared to each other, showed no such difference. The use of partnering in the task had no effect on Presence.

Turning now to **Looking-on**, as a category of gesture, Two-way, between-groups, Independent ANOVA tests, involving 'Participant–type', 'Partnering' and 'Looking-on', were undertaken. Levene's H-o-V test showed homogeneity-of-variance for Looking-on, $F(5, 33) = 1.562$, $p = 0.198$. There was a significant main effect of participant type on extent of Looking-on, $F(2, 33) = 13.16$, $p<0.0005$, with a large effect size, $\omega = 0.70$; (i.e. different types of participant were showing Looking-on to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and greater than that of their teachers (g = 31.62, b = 32.31 and t = 8.92). Bonferroni post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other (*p* = 1.000). There was a significant main effect for 'Partnering' as a variable, $F(1, 33) = 8.31$, $p = 0.007$, with a large effect size, $\omega = 0.60$ (p = 18.57 and np = 30.94) when participant type was not taken into account. The differences in means suggested that Looking-on was significantly more in evidence when the task did not involve partnering as part of the task structure. There was a non-significant interaction effect between type of participant and the use of

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[5] Calculating ω^2 for this data produced a negative value and so could not produce a square rooted value for ω. This occurs where the F-ratio value is less than 1 (suggesting that mean error variance is larger than the mean variance explained by the effect (Field and Hole, 2003, p200.). A good approximation to the effect size in these circumstances is that of zero as the actual value is usually around 0.001, very close to zero (ibid).

partnering in the task $F(2, 33) = 0.59$, $p= 0.562$, $\omega = 0$. Overall, pupils showed significantly more Looking-on in the TOG groups than did their teachers. Girls and boys, when compared to each other, showed no such difference. Higher mean use of Looking-on occurred when no-partnering was a feature of the tasks in this setting.

The third category of gesture to be examined using Two-way, between-groups, Independent ANOVA tests was that for **Indicative** gestures. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 33) = 2.36$, $p = 0.061$. There was a non-significant main effect of participant type on extent of Indicative gesture, $F(2, 33) = 3.04$, $p=0.061$, with a medium effect size, $\omega = 0.37$; (i.e. different types of participant were not showing Indicative gestures to different extents if 'Partnering' was ignored). When means were examined it was apparent that girls', boys' and teachers' means were all similar to each other (g = 6.00, b = 8.00 and t = 3.15). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 2.29$, $p = 0.140$, with a medium effect size, $\omega = 0.30$ (p = 6.86 and np = 4.39) when participant type was not taken into account. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 1.88$, $p= 0.829$, $\omega = 0$. Overall, no significant differences were apparent between participant types in their use of Indicative gestures, irrespective of whether or not partnering was a part of the task activity. There was also no apparent interaction between participant type and the use of partnering in a task when Indicative gestures were examined.

Further Two-way, between-groups, Independent ANOVA tests were used to examine the extent to which **Intermediary** gestures were apparent in the TOG setting tasks. These involved the same independent variables reported above. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 33) = 1.21$, $p = 0.326$. There was a significant main effect of participant type on extent of Intermediary gestures, $F(2, 33) = 22.49$, $p<0.0005$, with a large effect size, $\omega = 0.79$; (i.e. different types of participant were showing Intermediary gestures to very different extents if 'Partnering' was not taken into account). When

means were examined it was apparent that girls' and boys' means were similar to each other and greater than that of their teachers (g = 31.31, b = 30.92 and t = 8.85). Bonferroni post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other (p = 1.000). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 1.63$, $p = 0.211$, with a small-medium effect size, $\omega = 0.22$ (p = 25.52 and np = 21.56) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.37$, p= 0.695, $\omega = 0$. Overall, pupils showed significantly more Intermediary gesture in the TOG groups than did their teachers. Girls and boys, when compared to each other, showed no such difference. The variable 'Partnering' showed no apparent effect in relation to Intermediary gesture use.

Taken together the gesture results[6] suggested that both girls and boys were showing similar mean M%C count levels for each gesture category in the TOG setting[7]. Differences, where they occurred, were between pupils and teachers[8]. No difference in the extent of Indicative gestures was apparent between all three participant types. Indicative gestures were the least

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[6] As one way of examining the impact of using averages in relation to the proportional data, an approach suggested by Dr. Jane Hurry (personal communication) was employed. This approach, pooled proportional data from each participant type – girl, boy and teacher, across the groups in a particular teacher setting (TOG or TIG) and then allowed the ANOVA process, itself, to generate the averages to be compared (so the averages were across a setting, drawing on individual results, rather than, as in the current study, the average of the averages in each task group, averaged across a setting). The results arising from this approach are referred to via footnotes (identified as 'pool') in the results sections that follow. A parallel non-parametric analysis, using the Kruskal-Wallis test, and follow up paired Mann-Whitney tests, was also undertaken using the 'pool' data, as suggested by Dr. Hurry. The results from this analysis are reported as 'KW' results. In fact, overall, the results arising from this approach closely mirrored those arising from the approach adopted in the study, although a number showed a reduced homogeneity of variance. The associated non-parametric analysis on the same data also supported the results reported in subsequent sections (database, and results, for both, are summarised in Appendix 8).

[7] Pool data results: same as main results. KW results, same as main results (Appendix 8. Table 8.04 and Table 8.11).

[8] Dr. Hurry further noted that the sample size / composition, available in the current study, using her approach, were such that greater homogeneity in the teachers data (as there were very few teachers involved) might have been anticipated compared to that for the girls or boys data (there were relatively rather more of each compared to the teacher). This might well lead to Levene's test showing a lack of homogeneity, in addition to any underlying lack of homogeneity in the data.

observed for all participant types. Teachers used more Presence than both pupil-types and markedly less Looking-on gestures and less Intermediary gestures. When no-partnering was part of the task, Looking-on levels were significantly higher, compared to when partnering was used. 'Partnering' had no other effects on gesture use. There were no interaction effects between the variables 'Participant type', 'Partnering' and the categories of 'Gesture'[9].

5.2.4 Defining a 'profile'

In the preceding sections counts (M%C) for girls and boys were compared to each other for each of the four categories of gesture use. Similar comparisons were made between girls and boys and their teachers. Such comparisons, however, only shed light on the use of individual categories of gesture. In order to undertake the task all three types of participant used all four types of gesture categories.

To investigate how different gesture types were used, relative to each other, another index of gesture use was required. This needed to reflect the relative balance or extent of prevalence of use of particular categories in the girls', boys' or teachers' overall gestural activity. To represent this relative use in a summary form, the mean percentage count (M%C), or the percentage count (%C) in the case of the teachers, for each gesture category was compared to each of the other categories. The category counts were ranked, in order of decreasing frequency. A pattern of relative prevalence of use resulted. However, this 'ranking by frequency approach' (based on the data in Table 5.01, in this instance), is arbitrary in the sense that a simple ranking carried out in this way does not automatically establish when two values might be regarded as the same or different. As such a rule has to be introduced to

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[9] Dr. Hurry further noted that her approach (see previous footnote) did not allow the SPSS, ANOVA procedure to differentiate between, for example, a girl in a group that is using partnering, and one that is in a group where partnering is not being used. As a result only a one-way, between-group ANOVA could be used. Consequently, only results for participant type, rather than participant type and partnering are referred to, arising from her approach.

establish these boundaries. For the purposes of this account values were thus arbitrarily defined as 'the same' if they were at, or within, 10% of each other (This is further referred to in chapter 6). Each category was then represented by a capital letter. The relative prevalence of particular categories with respect to each other was shown by inserting a '**>**' sign between each category letter where the preceding category count was higher than that of the following category count. An '**=**' sign was used between category letters where category counts were of an equivalent level.

These patterns of letters and signs were arranged in a linear sequence of letters (indicating the categories) separated by either '>' or '=' signs. So, for example, where the category Presence (P) had a higher count (was more prevalent) than that of Looking-on (L) which had, in turn, an equivalent count (equally prevalent) to that of Indicative gestures, itself having a higher count than the Intermediary (In) category of gestures, the following prevalence-of-use-profile (called a 'profile' hereafter) resulted:

P > L = I > In

These profiles were established for girls, boys and teachers in each of the observed TOG groups and are summarised in Table 5.02 below. Inspection of the resulting table, focusing on all the gesture categories including Presence (P), suggested that girls, boys and teachers in the same groups might use the same or different profiles. However, profiles were not uniquely tied to particular tasks being apparent in different tasks and among different types of participant. It should also be noted that any conclusions derived from this approach are at best tentative, given the arbitrary basis of the 10% boundary condition applied to the relative differences involved.

5.2.5 TOG 'gesture-profiles'

In the TOG setting girls-and-boys-profiles were the same in 23% of the profiles (3 / 13), and different in the rest (77%). If one assumes that girls and

Table 5.02 Gesture-profiles (representing relative prevalence of category counts) for girls, boys and teachers, in the TOG groups (N = 13).

Group		Gesture-profiles [a]		
		Girls[b]	Boys[b]	Teacher[c]
TOG1a				
	1	P > **In > L = I**	P = **In > L = I**	P > **L = I = In**
	2	P = **In > L = I**	P = **In > L = I**	P > **In > I > L**
	3	**In** > P > **L = I**	**In** > P = **L= I**	P > **L = I = In**
	4	-	-	-
TOG1b				
	1	P = **L = In > I**	**L = In** > P > **I**	P > **L = I = In**
	2	P = **In > L > I**	P = **L = In > I**	P > **L = I = In**
	3	P = **L = In > I**	P > **L = In > I**	P > **L = I = In**
	4	-	-	-
TOG2a				
	1	**L** > P = **In > I**	P = **L > I = In**	P > **L > In > I**
	2	-	-	-
	3	**L** > P= **In > I**	**In > L** > P = **I**	P > **L = I = In**
	4	**L** > P = **In > I**	P = **In > L > I**	P > **L = I = In**
TOG2b				
	1	P > **L = In > I**	P = **In > L > I**	P > **L = I = In**
	2	P > **L = In > I**	P = **L > In > I**	P > **L = I = In**
	3	**L > In** > P = **I**	**L** > P = **In > I**	P > **L > In > I**
	4	**L** > P = **In > I**	**L** > P = **In > I**	P > **L = In > I**

Note: [a] = The linear sequence of letters in each profile starts with the most prevalent category and ends with the least prevalent category. The symbols in-between the letters either show that the preceding category was more prevalent than the one following ('>') or that they were of equivalent prevalence ('='). Where two or more values were at, or within, 10% of each other they were taken to be equivalent. The letters coding for the gesture categories were: P = Presence; L= Looking-on; I=Indicative; In= Intermediary: a category letter in bold print indicated an 'active' gesture category. [b] = units for each category letter were mean percentage counts (M%C). [c] = units for each category letter were percentage counts (%C). '-' = No observation took place.

boys, having different genders, might show different profiles in undertaking the same task using the same materials (profiles were associated with gender rather than task) the high percentage of different profiles would not be surprising. However, the 23%, of profiles that were the same *would then* be surprising. On the other hand, one could assume that particular tasks would have associated with them particular gesture profiles – reaching for and obtaining a crayon would involve the same gestures whoever reached for it. These would be shown irrespective of a person's gender (profiles were associated with task rather than gender). On this basis the percentage of tasks with the same profiles, would be understandable but the high percentage of those with different profiles *would not.*

Turning to the teachers' profiles in comparison to those of the pupils, there were no common profiles between girls and boys and teachers in particular tasks. As all the teachers were female, a gendered explanation as suggested earlier might anticipate that girl's and teacher's profiles might be similar in particular tasks and different to those of the boys in the same task. The extent of the different profiles already noted would then need explaining. If a profile was linked to task activity, the second possibility offered earlier, pupils and teachers doing the same task should have shown similar profiles - again the extent of the difference in actually observed profiles would require explanation.

However, a third possibility suggests itself, which would not apply to the girls and boys. Profiles might have been associated with the *role* that a particular participant had in the tasks being undertaken. Pupils' and teachers' roles would have been different in this setting as pupils would be undertaking the task and the teacher resourcing and supporting the task. On this basis, given their common roles – as pupils doing the tasks – girls' and boys' profiles would be expected to be similar in the same tasks (which they largely were not as reported above) but different to those of their teachers (which they were).The lack of similarity, on the basis of this explanation would then need further explanation. These three possibilities – or an interaction between them

– will recur in relation to the other observed variables, gesture-targeting and task-activity. They also relate to the incidence of active-profiles and will be discussed further in chapter 6

5.2.6 Active-gesture-profiles

If Presence was removed from the profile (by focusing on the bold print categories of **L, I** and **In** in Table 5.02 above), the focus shifted onto active gesturing, creating an 'active-gesture-profile'. The active-gesture-profiles shown by each participant type in a group – in terms of emphasis within the profile - could differ. This could come about in one of three ways. First, they could have the same order of active-gesture categories in their profile and the same prevalence-of-use relationship e.g. girls **In > L = I**, boys **In > L = I**, as in the case of group TOG1a-1 (Table 5.02). These were described as having the '*same*' active-gesture-profile when compared. Second, they could have a similar sequence of categories but two or more categories could have been used to the same extent e.g. girls **In > L > I,** and boys, **In = L > I,** as in the case of TOG1b-2 (Table 5.02). Both boys and girls, in this example, used Looking-on gestures more than Indicative gestures and girls used Intermediary gestures to a greater extent than Looking-on gestures, whereas boys used Intermediary gestures to the same extent as Looking-on gestures. These were described as having '*related*' active-gesture-profiles when compared. Finally, in the third type of pattern, the order of active-gesture categories in the profile could be different to each other with either similar or different frequencies of use between categories. The case of group TOG2a3 (Table 5.02) served as an example of this type of pattern: girls showed **L > In > I**, and boys, **In > L > I.** These were described as having '*different*' active-gesture-profiles *w*hen compared.

An increased commonality in these profiles, between girls-and-boys (62%), was apparent. Equally, common active-gesture-profiles between girls-and-

teachers increased slightly to 23%, 46% being related, and the balance, different (31%). For boys-and-teachers, 15% were common, 53% related, and 42% different.

Among the groups in the TOG setting (Table 5.02), 54% (7 / 13) showed the *same* active-gesture-profile among girls and boys and 15% (2 / 13) showed a *related* active-gesture-profile. A distinctly *different* active-gesture-profile was apparent in 31% (4 / 13) of the groups. In the majority of groups (69%) girls' and boys' active-gesture-profiles, when compared to each other, were either the same or related.

Comparing girls' and boys' active-gesture-profiles to those of their teacher, within each group, revealed that the extent of *same* active-gesture-profiles was 8% (1 / 13); those that were *related* were 69% (9 / 13) for girls, and 62% (8/13) for boys, and those that were *different*, 23% (3 /13) for girls, and 31%(4 / 13) for boys. Here even though the girls and boys, when compared to their teachers, had different task roles, the majority of the profiles (77% for girls and 70% for boys) were the same or related. These issues are discussed in chapter 6. Where differences were apparent it is worth recalling that this was based on a minimum difference of 10% between categories in the profile. It is to this extent that differences – and similarities between girls', boys' and teachers' data are being discussed. Assessment of the importance of these differences has therefore to be cautious.

5.2.7 TOG active-gesture-profiles: types and range

To explore these patterns further in terms of active-gesture-profile types, the *range* of different profiles were examined. Table 5.03 shows, when the 'All' columns are examined, that the range of active-gesture-profiles used by the girls, across all the groups, was slightly narrower than those of the boys and reflected a different balance of active-gesture-profile types. For both girls and

boys, these differences were linked to different classrooms. This suggested a classroom level difference rather than a group level difference.

The teachers in the two classrooms also showed a difference in the range of active-gesture-profiles *they* used. Teacher 1 showed a narrower range than Teacher 2 (again reflecting a classroom level difference). In the former case,

Table 5.03. Percentage incidence of particular active-gesture-profiles types among girls, boys and teachers in the TOG setting.

	Percentage of observations [a]								
	Girls			Boys			Teacher		
Active-gesture-profile	T1 (6)	T2 (7)	**All (13)**	T1 (6)	T2 (7)	**All (13)**	T1 (6)	T2 (7)	**All (13)**
L = I = In							83	57	**69**
L > I = In					14	**8**			
L > In > I		71	**39**		43	**23**		29	**15**
L = In > I	33	29	**31**	50		**23**		14	**8**
In > L > I	17		**8**		43	**23**			
In > L = I	50		**23**	50		**23**			
In > I > L							17		**8**

Note: **[a] =** Percentage calculations: for each teacher group the percentage number of total observations in which a particular active-gesture-profile type was found is given. Column percentage totals subject to rounding-up error. T1: profiles from T1's groups (a and b), T2: profiles from T2's groups (a and b). Gesture pattern categories: L = Looking-on gestures; I = Indicative gestures; In = Intermediary gestures; '=' = Equivalent level of relative category use; '>' Preceding category (s) of greater prevalence than following category.

the majority of her active-gesture-profiles showed similar levels of gestural activity across categories, in the latter, nearly half were specifically, Looking-on-led profiles. T1 also used the only instance of an Indicative-led active-gesture-profile in the TOG results.

The apparent differences between the two classrooms may reflect a less interventionist approach by Teacher 2, whose active-gesture-profiles were Looking-on-led (involving gaze, leaning and turning) rather than Intermediary-

led (involving handling, holding and handing-on) or more general profiles like Teacher 1.

Overall, unlike the ANOVA results for girls and boys, which showed no difference in their use of particular gestures, there did appear to be some tentative evidence for some differences in their *active-gesture-profiles.* However, consistent with the statistical data, differences between pupils-types and teachers, in their gesture-profiles, were still apparent.

5.3 TOG gesture-targets

5.3.1 Gesture-targeting counts

The data on gesture-targeting categories in the TOG setting, shown in Table 5.04 (next page) was calculated on the same counts basis as that in Section 5.2.1 previously. The mean use of each category by each type of participant – girls, boys and teachers – across all the groups was calculated. The resulting 'mean of means' (for the pupils) and mean (for the teachers), are shown as a bar chart (Figure 5.02).

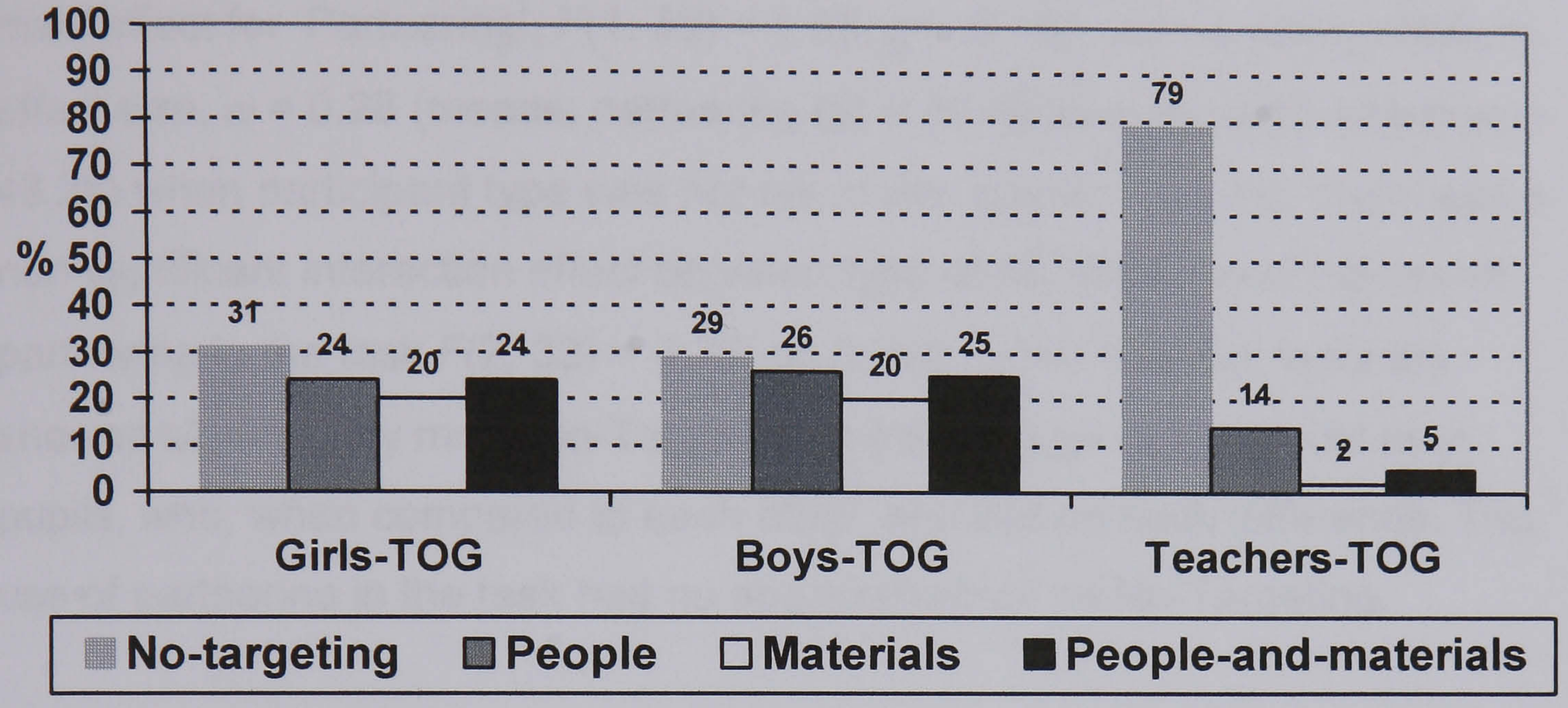
Among the girls and boys, **No-targeting**, was at a very slightly higher level than that of **Targeting-to-People** and **Targeting-to-People-and-Materials,** which were in turn, at very slightly higher levels than **Targeting-to-People**. Teachers showed much less targeting activity of any sort; No-targeting being at much higher levels than for either type of pupil. Among teachers, where targeting occurred, Targeting-to-People was more frequent than Targeting-to-People-and-materials. Teacher Targeting-to-Materials was at a similarly very low level. As had been the case for the gesture results (Figure 5.01), girls and boys were showing similar levels of gesture-targeting, when compared to each other, but these were different to those of their teachers.

Table 5.04. Mean percentage count (M%C) for girls and boys and Percentage count (%C) for teachers in each gesture-targeting category, in each TOG group (N = 13).

	Gesture-target categories											
	Inactive			Active								
	No-targeting			People			Materials			People and materials		
Group Task	g	b	t	g	b	t	g	b	t	g	b	t
TOG1a												
1	51	33	73	14	30	26	7	14	0	28	23	1
2	37	43	61	20	17	15	18	19	3	24	21	21
3	28	23	96	20	36	4	28	17	0	24	24	0
4	-	-	-	-	-	-	-	-	-	-	-	-
TOG1b												
1	27	15	73	39	39	9	9	30	9	24	15	9
2	33	31	92	18	16	3	30	21	3	18	33	3
3	30	49	93	27	21	7	9	6	0	34	24	0
4	-	-	-	-	-	-	-	-	-	-	-	-
TOG2a												
1	19	33	61	28	19	26	28	21	3	25	26	10
2	-	-	-	-	-	-	-	-	-	-	-	-
3	20	12	100	32	23	0	24	24	0	24	41	0
4	26	26	100	21	16	0	12	17	0	40	40	0
TOG2b												
1	48	41	81	13	18	19	24	21	0	14	19	0
2	57	42	74	18	23	16	11	20	7	14	15	3
3	6	14	70	42	42	26	28	23	0	24	20	4
4	23	19	58	23	35	32	32	26	0	23	19	11
Total	405	381	1032	315	335	183	260	259	25	316	320	62
Groups	13	13	13	13	13	13	13	13	13	13	13	13
Mean[a]	31	29	79	24	26	14	20	20	2	24	25	5

Note: g = Girl pupil; b = Boy pupil; t = Female teacher. **'-'** = No observation took place.
Mean[a] = Arithmetic mean rounded to nearest whole number. All figures rounded to nearest whole count with rounding errors of +/- 1%.

Fig 5.02 Gesture-targeting in the TOG setting: mean of the mean percentage count (M%C) for girls and boys and mean percentage count (%C) for teachers in each category.



Note: There were 13 groups in the TOG setting. Mean counts rounded to nearest whole count with rounding errors of +/- 1%.

5.3.2 Two-way, between-groups, Independent ANOVA tests: 'Participant-type' X 'Partnering', for categories of TOG 'Gesture-targets'

A series of two-way, between-groups ANOVA tests using 'Participant type' and 'Partnering' as the independent variables and the various categories, in turn, of the variable 'Gesture-targets' as the dependent variable, were undertaken using data taken from Table 5.04.

Looking first at effects for **No-Targeting** as a gesture-targeting category, Levene's homogeneity of variance test (H-o-V) was not violated; $F(5, 33) = 0.47$, $p = 0.793$. There was a significant main effect of participant type on extent of No-Targeting, $F(2, 33) = 53.07$, $p<0.0005$, with a large effect size, $\omega = 0.89$; (i.e. different types of participant were showing No-Targeting to very

different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and lower than that of their teachers (girls (g) = 31.15, boys (b) = 29.31 and teachers (t) = 79.38). Bonferroni post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other (p = 1.000). There was a non-significant main effect for 'Partnering', $F(1, 33) = 1.88$, $p = 0.180$, with a nearly medium effect size, $\omega = 0.28$ (means; partnering (p) = 49.48 and no-partnering (np) = 43.28) when participant type was not taken into account. Finally, there was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.23$, $p= 0.799$, $\omega = 0$. Overall, teachers showed significantly more No-Targeting in the TOG groups than did their pupils, who, when compared to each other, showed no such difference. The use of partnering in the task had no apparent effect on No-Targeting.

Turning now to **Targeting-to-People**, as a category of gesture-targeting, Two-way, between-groups, Independent ANOVA tests, involving 'Participant–type', 'Partnering' and 'Looking-on', were undertaken. Levene's H-o-V test showed homogeneity-of-variance for Looking-on, $F(5, 33) = 1.77$, $p = 0.148$. There was a significant main effect of participant type on extent of Targeting-to-People, $F(2, 33) = 5.68$, $p = 0.008$, with a large effect size, $\omega = 0.52$; (i.e. different types of participant were showing Targeting-to-People to different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and greater than that of their teachers (g = 24.24, b = 25.77 and t = 14.08). Bonferroni post hoc tests showed that girls' and boys' means were just significantly different to those of their teachers (girls, $p = 0.038$, boys $p = 0.014$) but not to each other (p = 1.000). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 1.28$, $p = 0.266$, with a just below medium effect size, $\omega = 0.25$ (p = 19.71 and np = 23.28) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 1.09$, $p= 0.348$, $\omega = 0$. Overall, pupils showed significantly more Targeting-to-People in the TOG groups than did their teachers. Girls

and boys, when compared to each other, showed no such difference. The use of partnering in the task had no apparent effect on levels of Targeting-to-People.

The third category of gesture-targeting to be examined, using Two-way, between-groups, Independent ANOVA tests, was that for **Targeting-to-Materials**. Levene's H-o-V test showed a lack of homogeneity-of-variance, $F(5, 33) = 4.99$, $p = 0.002$. The likely source of this non-homogeneity was in the lack of variation in the teacher's results compared to that in the two pupil values. With a warning about the accuracy of the following results, in this respect, the reader is left to judge the results for themselves (see the discussion in chapter 6). There was a significant main effect of participant type on extent of Targeting-to-Materials, $F(2, 33) = 35.01$, $p<0.0005$, with a large effect size, $\omega = 0.85$; (i.e. different types of participant were showing Targeting-to-Materials to very different extents if 'Partnering' was ignored). When means were examined it was apparent that girls' and boys' means were similar to each other and much greater than that of their teachers (g = 19.96, b = 19.92 and t = 1.92). Games-Howells (as there was a lack of homogeneity-of-variance in the underlying data) post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other ($p = 0.997$). There was a just significant main effect for 'Partnering' as a variable, $F(1, 33) = 4.54$, $p = 0.041$, with a large effect size, $\omega = 0.46$ (p = 11.86 and np = 16.17) when participant type was not taken into account. From the means it seemed that Targeting-to-Materials was more apparent when the task involved no-partnering. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.18$, $p= 0.833$, $\omega = 0$. Overall, pupils showed significantly more Targeting-to-Materials in the TOG groups than did their teachers. Girls and boys, when compared to each other, showed no such difference. The use of partnering in the task suggested Targeting-to-Materials was more likely when partnering was not part of the task structure. However, there were no apparent interactions between 'Participant-type' and 'Partnering' when Targeting-to-Materials was examined.

Further Two-way, between-groups, Independent ANOVA tests were used to examine the extent to which **Targeting-to-People-and-materials** was apparent in the TOG setting tasks. These involved the same independent variables reported above. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 33) = 1.18$, $p = 0.341$. There was a significant main effect of participant type on extent of Targeting-to-People-and-materials, $F(2, 33) = 29.50$, $p<0.0005$, with a large effect size, $\omega = 0.83$; (i.e. different types of participant were showing Targeting-to-People-and-materials to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and greater than that of their teachers (g = 24.31, b = 24.46 and t = 4.77). Bonferroni post hoc tests showed that girls' and boys' means were very significantly different to those of their teachers (both *ps* <0.0005) but not to each other ($p = 1.000$). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 0.43$, $p = 0.516$, $\omega = 0$ (p = 18.57 and np = 17.00) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.58$, $p= 0.566$, $\omega = 0$. Overall, pupils showed significantly more Targeting-to-People-and-materials in the TOG groups than did their teachers. Girls and boys, when compared to each other, showed no such difference. The variable 'Partnering' showed no apparent effect in relation to Targeting-to-People-and-materials.

Overall the gesture-targeting results[10] suggested that both girls and boys were showing similar mean M%C count levels for each targeting category in the TOG setting: differences were between pupils and teachers. Teachers used more No-Targeting than pupils and markedly less Targeting-to-People, Targeting-to-Materials and Targeting-to-People-and-materials. The 'Partnering' variable only had a slightly significant effect when Targeting-to-Materials was examined (no effects were apparent for the other categories of

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[10] Pool data results: as given above, except: no difference between all three participant types in Targeting-to-People-and-Materials, but this completely lacked homogeneity of variance so the test result was unreliable (the KW tests on the same data supported pupil use being significantly greater than teacher use). See Appendix 8, Tables 8.05 and 8.12.

targeting). This effect suggested that mean use of Targeting-to-Materials in no-partnering groups was higher than when partnering was part of the task. No interaction effects were apparent for any of the targeting categories and the two independent variables.

5.3.3 TOG gesture-targeting-profiles

The same approach described in section 5.2.7 in respect of gesture-use was used to construct gesture-targeting profiles in the TOG setting. The resulting profiles, for girls, boys and teachers, are shown in Table 5.05. In 39% (5 / 13) of the observations in Table 5.05, girls' and boys' profiles were the same so that overall their targeting-profiles were different (61% (8 / 13) in contrast to the statistical results presented earlier which showed no difference between girls and boys on the use of individual types of targeting. Moreover, as these comparisons were *within* particular tasks, where girls and boys were showing different targeting-profiles, they were doing so in the same tasks. In only one instance (8%) did girls, show the same targeting-profile as teachers (TOG2b-2). All the boyss profiles were different to those of their teachers. This agreed, at a profile level, with the statistical results for individual targeting categories reported earlier. As with the gesture-profiles, reported in section 5.2.5, particular targeting-profiles recurred across groups for all three participant types.

5.3.4 Active-gesture-targeting-profiles

Excluding the No-targeting values (as Presence had been excluded from the profiles for Gesture – see section 5.2.6) by focusing on the bold print patterns in Table 5.05 created active-gesture-targeting-profiles. Applying the

Table 5.05 Gesture-targeting-profiles (representing relative prevalence of category counts) for girls, boys and teachers in the TOG groups (N = 13).

Group	Gesture-targeting-profiles [a]		
	Girls[b]	Boys[b]	Teacher[c]
TOG1a			
1	N > **Pm > P = M**	N = **P = M = Pm**	N > **P > M = Pm**
2	N > **P = M = Pm**	N > **P = M = Pm**	N > **P = Pm > M**
3	N = **P = M = Pm**	**P >** N = **M = Pm**	N > **P = M = Pm**
4	-	-	-
TOG1b			
1	**P>** N > **M = Pm**	**P = M >** N = **Pm**	N > **P = M = Pm**
2	N = **M > P = Pm**	N = **P = M = Pm**	N > **P = M = Pm**
3	**Pm >** N = **P > M**	N > **P = Pm > M**	N > **P = M = Pm**
4	-	-	-
TOG2a			
1	N = **P = M = Pm**	N = **P = M = Pm**	N > **P > M = Pm**
2	-	-	-
3	N = **P = M = Pm**	**Pm > P = M >** N	N > **P = M = Pm**
4	**Pm >** N = **P > M**	**Pm >** N = **P = M**	N > **P = M = Pm**
TOG2b			
1	N > **P = M = Pm**	N > **P = M = Pm**	N > **P > M = Pm**
2	N > **P = M = Pm**	N > **P = M > Pm**	N > **P = M = Pm**
3	**P > M = Pm >** N	**P > M = Pm >** N	N > **P > M = Pm**
4	N = **P = M = Pm**	N = **P = M = Pm**	N > **P > Pm > M**

Note: [a] = The linear sequence of letters in each profile starts with the most prevalent category and ends with the least prevalent category. The symbols in-between the letters either show that the preceding category was more prevalent than the one following ('>') or that they were of equivalent prevalence ('='). Where two or more values were at, or within, 10% of each other they were taken to be equivalent. The letters coding for the gesture-targeting categories were: N = No-targeting; P = Targeting-to-people; M = Targeting-to-materials; Pm = Targeting-to-people-and-materials. A category letter in bold print indicated an 'active' gesture-targeting category. [b] = units for each category letter were mean percentage counts (M%C). [c] = units for each category letter were percentage counts (%C). '-' = No observation took place.

categories of *same*, *related* and *different* (see section 5.2.6) revealed, first, that girls-and-boys comparisons of patterns showed that a number of profiles were the *same* 39% (5 / 13). A slightly larger proportion were *related* (46%: 6/13), the balance being, *different* (15%: 2 / 13). The majority of the patterns were thus the same or related (85%).

Comparing girls and boys, respectively, with their teacher showed few profiles that were the *same* - girls-and-teachers, 31% (4 / 13) and boys-and-teachers, 23%(3 / 13). There were a higher percentage of *related* targeting profiles - girls-and-teachers, 39% (5 / 13) and boys-and-teachers, 54% (7 / 13). Girls-and-teachers showed *different* profiles in 31% (4 / 13) of groups, boys-and-teachers, in 23% (3 / 13). As for the girls and boys comparisons, the majority of the active-gesture-targeting-profiles were either the same or related (girls-and-teachers, 70% and boys-and-teachers, 77%). The ANOVA results had suggested consistent differences between girls and boys and their teachers. The active-gesture-targeting-profiles were suggesting, to the contrary, much greater similarity in targeting behaviours, as represented in the profiles among the various types of participant. However, as the criterion for deciding that two values were different, when working out these profiles, was arbitrarily set at 10%, these results may be an artefact of this criterion rather than a real effect.

5.3.5 TOG active-gesture-targeting-profiles: types and range

The range and extent of different types of active-gesture-targeting-profiles, among the TOG groups, were examined next. These were identified on the same basis as those for active-gesture-profiles in section 5.2.7. The results are reported in Table 5.06.

Table 5.06 Percentage incidence of particular active-gesture-targeting-profiles among girls, boys and teachers in the TOG setting.

	Percentage of observations [a]								
	Girls			Boys			Teacher		
Targeting-profiles	T1 (6)	T2 (7)	**All (13)**	T1 (6)	T2 (7)	**All (13)**	T1 (6)	T2 (7)	**All (13)**
P = M = Pm	33	71	**54**	67	43	**54**	67	43	**54**
P > M = Pm	17	14	**15**		14	**8**	17	43	**31**
P = M > Pm				17	14	**15**			
P > Pm > M								14	**8**
P = Pm > M	17		**8**	17		**8**	17		**8**
M > P = Pm	17		**8**						
Pm > P > M		14	**8**						
Pm > P = M	17		**8**		29	**15**			

Note: [a] = Percentage calculations: For each teacher group the percentage number of total observations in which a particular active gesture-targeting-profile was found is given. Column percentage totals subject to rounding-up error. T1**:** profiles from T1's groups (a and b**),** T2**:** profiles from T2's groups (a and b). Gesture-target categories: P = People; M = Materials; Pm = People-and-materials; '=' = Equivalent level of relative category use; '>' = Preceding category (s) of greater prevalence than following category.

Looking first at the 'All' columns in Table 5.06, girls and boys showed a slightly wider range of active-gesture-targeting-profiles compared to each other, depending on which class they were in. Within the spread of profiles, a slightly different emphasis was also apparent. Girls' profiles provided limited evidence of showing Targeting-to-Materials profiles as a distinct type of profile when boys did not. Boys, however, showed a slight tendency towards Targeting-to-People-and-materials type profiles. The range of boys' active-gesture-targeting-profiles was closer to that of the teachers than was that of the girls. Teachers, like the boys, showed no Materials-led profiles in contrast to the girls. But teachers also showed no Targeting-to-People-and-materials led profiles as both the girls and boys had done.

The two teachers showed small differences in spread, but noticeable differences in emphasis, in the particular profiles used. T1 used more of the

general, **P = M = Pm**, profile than her colleague. Equally, girls and boys in Teacher T1's classroom showed notable differences in the range of profiles used, while those in T2's classroom were more similar, differing in emphasis rather than diversity of range. Overall girls and boys used different targeting-profiles to each other and to their teachers. These profiles also differed in the two classrooms. The implications of these differences will be discussed in Chapter 6.

5.4 TOG task-activity

5.4.1 Task-activity counts

The data for the Task-activity variable, counted on the same basis as that for Gesture (section 5.2.2) and Gesture-targeting (section 5.3.1), are summarised in Table 5.07 for the 13 TOG groups and their participants.

The first category of task-activity was '**No-activity**', where participants were inactive. The second was '**Observing**' based on participants watching the activity of others. The third category was '**Speaking**' which identified speech directed at the group as a whole or particular other participants. The last category was '**Using-materials**', where a particular individual was using task materials or other resources in the context of the task.

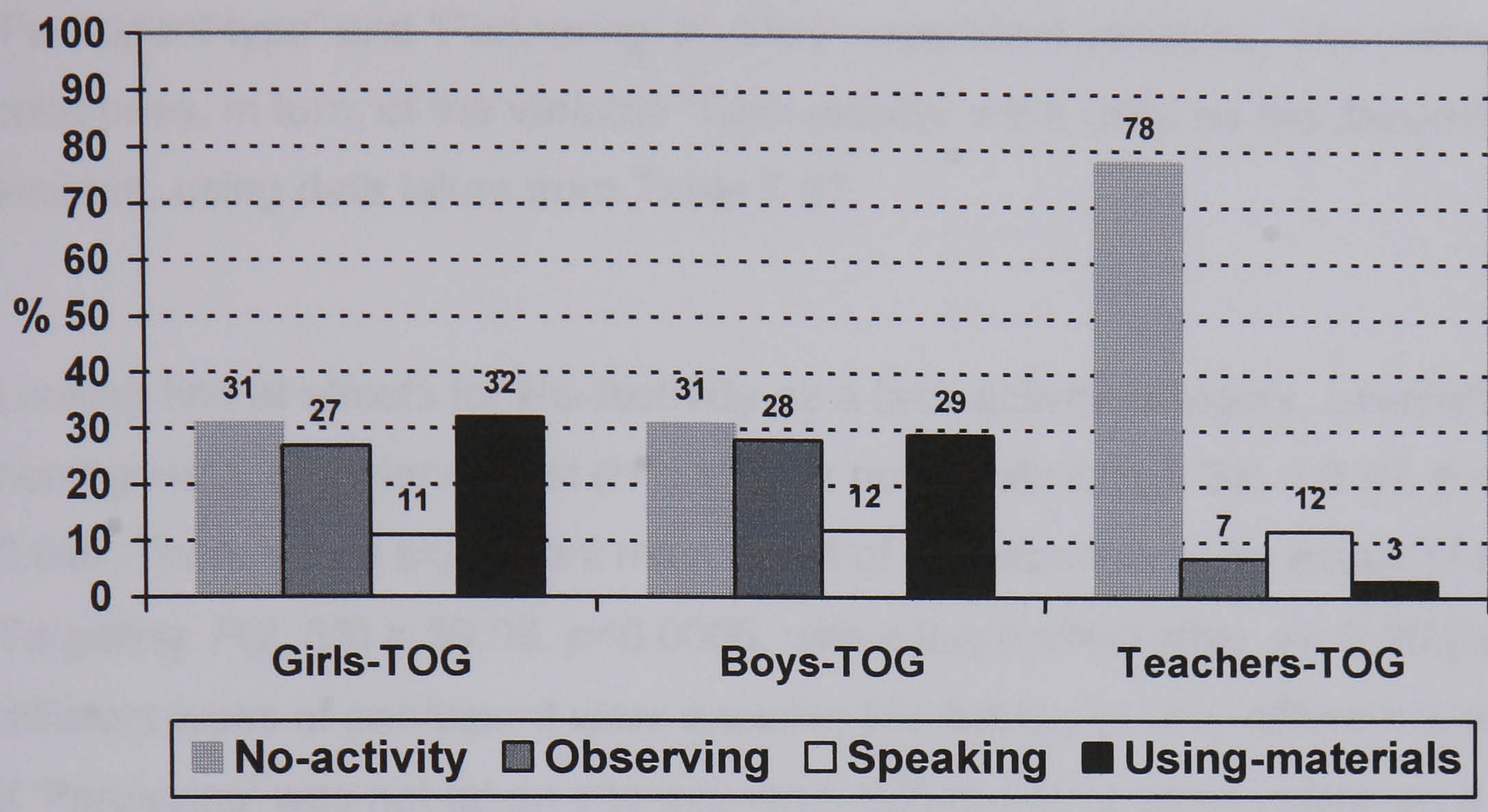
To get an overview of the relative frequency of particular categories among the groups, means were calculated for each category. The resulting 'mean-of-mean' counts (for girls and boys) and mean counts (for teachers) are shown as a bar chart (Figure 5.03).

Table 5.07 Mean percentage count (M%C) for girls and boys and Percentage count (%C) for teachers in each task-activity category, in each TOG group (N = 13).

	Task-activity categories											
	Inactive			Active								
	No-activity			Observing			Speaking			Using-materials		
Group Task	g	b	t	g	B	t	g	b	t	g	b	t
TOG1a												
1	49	37	74	18	23	14	4	16	11	30	25	1
2	38	43	60	17	18	6	17	14	27	28	26	8
3	28	37	96	22	23	0	22	16	4	28	25	0
4	-	-	-	-	-	-	-	-	-	-	-	-
TOG1b												
1	27	15	73	49	70	0	3	0	9	21	15	18
2	33	30	92	27	19	0	9	23	6	31	29	3
3	30	49	93	25	20	0	24	17	7	21	14	0
4	-	-	-	-	-	-	-	-	-	-	-	-
TOG2a												
1	21	35	61	23	19	10	16	13	26	41	33	3
2	-	-	-	-	-	-	-	-	-	-	-	-
3	20	13	96	36	27	4	8	19	0	36	41	0
4	26	24	100	28	19	0	9	11	0	37	46	0
TOG2b												
1	46	42	76	18	19	17	6	6	7	30	33	0
2	55	40	71	15	23	13	7	19	16	24	19	0
3	7	14	74	39	57	4	16	4	22	39	24	0
4	20	23	53	35	27	21	0	0	21	46	51	5
Total	400	402	1019	352	364	89	141	158	156	412	381	38
Groups	13	13	13	13	13	13	13	13	13	13	13	13
Mean[a]	31	31	78	27	28	7	11	12	12	10	29	3

Note: g = Girl pupil; b = Boy pupil; t = Female teacher. **'-'** = No observation took place.
Mean[a] = Arithmetic mean rounded to nearest whole number. All figures rounded to nearest whole count with rounding errors of +/- 1%.

Fig 5.03 Task-activity in the TOG setting: mean of the mean percentage count (M%C) for girls and boys and mean of the percentage count (%C) for teachers.



Note: There were 13 TOG groups. Mean counts rounded to nearest whole count with rounding errors of +/- 1%.

Among the girls and boys, **No-activity**, **Observing** and **Using-materials** were at similar levels. However, **Speaking** in comparison to the other categories, was at markedly lower levels for girls and boys. Teachers mainly had No-activity as their most frequent category of task-activity. This level was much higher than for either type of pupil. Teachers' use of Speaking was at a marginally higher level than their use of Observing or Using-materials. These differences, it is argued, reflected the different roles in the activity that each type of participant had: girls and boys were *doing* the task; teachers were visiting the group and supporting pupils in *their* execution of the task.

5.4.2 Two-way, between-groups, Independent ANOVA tests: 'Participant-type' X 'Partnering', for categories of TOG 'Task-activity'

A series of Two-way, between-groups, Independent ANOVA tests using 'Participant type' and 'Partnering' as the independent variables. The various categories, in turn, of the variable 'Task-activity' were used as the dependent variable, using data taken from Table 5.07.

Looking first at effects for **No-Activity** as a task-activity category, Levene's homogeneity of variance test (H-o-V) was not violated; $F(5, 33) = 0.40$, $p = 0.849$. There was a significant main effect of participant type on extent of No-Targeting, $F(2, 33) = 59.06$, $p<0.0005$, with a large effect size, $\omega = 0.90$ (i.e. different types of participant were showing No-Activity to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and much lower than that of their teachers (girls (g) = 29.77, boys (b) = 30.92 and teachers (t) = 80.00). Bonferroni post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other ($p = 1.000$). There was a non-significant main effect for 'Partnering', $F(1, 33) = 2.57$, $p = 0.118$, with a small effect size, $\omega = 0.33$ (means; partnering (p) = 50.10 and no-partnering (np) = 43.17) when participant type was not taken into account. Finally, there was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.34$, $p= 0.716$, $\omega = 0$. Overall, teachers showed significantly more No-Activity in the TOG groups than did their pupils, who, when compared to each other, showed no such difference. The use of partnering in the task had no apparent effect on No-Activity.

Turning now to **Observing**, as a category of task-activity, Two-way, between-groups, Independent ANOVA tests, involving 'Participant–type', 'Partnering' and 'Observing', were undertaken. Levene's H-o-V test showed a significant result and thus a lack of homogeneity-of-variance, $F(5, 33) = 4.41$, $p <$ 0.0005. The likely source of this non-homogeneity was in the lack of variation

in the teacher' results compared to that in the two pupil values. With a warning about the accuracy of these particular results, the reader is left to judge for themselves (see the discussion in chapter 6). There was a significant main effect of participant type on extent of Observing, $F(2, 33) = 18.01$, $p<0.0005$, with a large effect size, $\omega = 0.75$; (i.e. different types of participant were showing Observing to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and greater than that of their teachers (g = 27.38, b = 28.00 and t = 5.54). Games-Howell post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (girls', p<0.0005 and boys', $p = 0.001$) but not to each other ($p = 0.993$). There was a just non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 4.07$, $p = 0.0.052$, with a small effect size, $\omega = 0.44$ (p = 17.00 and np = 24.17) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 1.54$, $p= 0.230$, $\omega = 0$. Overall, pupils showed significantly more Observing in the TOG groups than did their teachers. Girls and boys, when compared to each other, showed no such difference. The use of partnering in the task had no apparent effect on levels of Observing.

The third category of task-activity to be examined, using Two-way, between-groups, Independent ANOVA tests, was that for **Speaking**. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 33) = 1.01$, $p = 0.427$. There was a non-significant main effect of participant type on extent of Speaking, $F(2, 33) = 0.01$, $p = 0.995$, $\omega = 0$, (i.e. different types of participant were not showing Speaking to different extents if 'Partnering' was ignored). When means were examined it was apparent that girls' and boys' and teachers' means were all very similar to each other (g = 12.08, b = 12.15 and t = 12.08). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 0.01$, $p = 0.943$, $\omega = 0$ (p = 12.19 and np = 12.00) when participant type was ignored. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.57$, $p= 0.572$, $\omega = 0$. Overall, participants showed no significant difference in their mean use of

Speaking as a task-activity in the TOG task setting. 'Partnering' as a variable did not appear to affect 'Speaking' as a task-activity.

Further Two-way, between-groups, Independent ANOVA tests were used to examine the extent to which **Using-materials,** as a task-activity, was apparent in the TOG setting tasks. These involved the same independent variables reported above. Levene's H-o-V test just lacked homogeneity-of-variance, $F(5, 33) = 2.66$, $p = 0.040$. There was a significant main effect of participant type on extent of Using-materials, $F(2, 33) = 49.50$, $p < 0.0005$, with a large effect size, $\omega = 0.88$, (i.e. different types of participant were showing Using-materials, to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and much greater than that of their teachers (g = 31.23, b = 29.31 and t = 2.54). Bonferroni post hoc tests showed that girls' and boys' means were very significantly different to those of their teachers (both *ps* <0.0005) but not to each other ($p = 1.000$). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 33) = 0.03$, $p = 0.956$, $\omega = 0$ (p = 21.10 and np = 20.94) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 33) = 0.70$, $p = 0.506$, $\omega = 0$. Overall, pupils showed significantly more Using-materials, in the TOG groups than did their teachers. Girls and boys, when compared to each other, showed no such difference. The variable 'Partnering' showed no apparent effect in relation to Using-materials.

In summary, the two-way ANOVA task-activity results suggested that both girls and boys were showing similar mean M%C count levels for each task-activity category in the TOG setting[11]. Where differences were apparent they were between pupils and teachers. Teachers showed more No-Activity than pupil-types and markedly less mean levels of Observing and Using-materials. All three types of participant showed similar mean levels of Speaking. The

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[11] Pool data results and KW test results consistent with main results. See Appendix 8, Tables 8.06 and 8.13.

'Partnering' variable had no apparent effects on the mean level of any of the task-activity categories. Equally, their were no interaction effects apparent between the variables 'Participant-type', 'Partnering' or the categories of 'Task-activity'.

5.4.3 TOG task-activity-profiles

Profiles of task-activity were created on the same basis as those for gesture (see section 5.2.7) and gesture-targets (section 5.3.5). These are shown in Table 5.08. The various task-activity categories were abbreviated as follows: 'N', No-activity; 'O', Observing; 'S', Speaking and 'U', Using-materials. The profiles represented the pattern of prevalence of mean scoring across all the task-activity categories for each type of participant in each group. In only 31% (4 /13) of the groups did girls and boys show a common task-activity-profile, the balance being different to varying degrees. This was again in contrast to the results of the ANOVA tests which showed that on each individual category, girls and boys used the category to a statistically similar extent. In 15% (2/13) of the groups, girls', boys', and teachers' task-activity profiles matched each other.

5.4.4 TOG active-task-activity-profiles

Using only the task-activity categories shown in bold print in Table 5.08 generated task-activity profiles based on the active task-activity categories alone. Focusing on these types of profiles – the active-task-activity-profiles - revealed that girls and boys showed the *same* profile in 54% (7 / 13) of the

Table 5.08 Task-activity-profiles (representing relative prevalence of category counts) for girls, boys and teachers, in the TOG setting (N = 13).

Group		Task-activity-profile [a]		
		Girls[b]	Boys[b]	Teacher[c]
TOG1a				
	1	**N > U > O > S**	**N > O = S = U**	**N > O = S > U**
	2	**N = U > O = S**	**N > O = S = U**	**N > S > O = U**
	3	**N > O = S = U**	**N = O = S = U**	**N > O = S = U**
	4	-	-	-
TOG1b				
	1	**O > N = U > S**	**O > N = U > S**	**N > O = S = U**
	2	**N = O = U > S**	**N = S = U > O**	**N > O = S = U**
	3	**N = O = S = U**	**N > O = S = U**	**N > O = S = U**
	4	-	-	-
TOG2a				
	1	**U > N = O = S**	**N = U > O = S**	**N > S > O = U**
	2	-	-	-
	3	**O = U > N > S**	**O = U > N = S**	**N > O = S = U**
	4	**U > N = O > S**	**U > N = O = S**	**N > O = S = U**
TOG2b				
	1	**N > U > O > S**	**N = U > O > S**	**N > O = S = U**
	2	**N > O = S = U**	**N > O = S = U**	**N > O = S > U**
	3	**O = U > S = N**	**O > N = S = U**	**N > S > O = U**
	4	**O = U > N > S**	**U > N = O > S**	**N > O = S > U**

Note: [a] = The linear sequence of letters in each profile starts with the most prevalent category and ends with the least prevalent category. The symbols in-between the letters either show that the preceding category was more prevalent than the one following ('>') or that they were of equivalent prevalence ('='). Where two or more values were at, or within, 10% of each other they were taken to be equivalent. The letters coding for the task-activity categories were: N= No activity; O = Observing; S = Speaking; U = Using-materials: a category letter in bold print indicated an 'active' task-activity category. '[b]' = units for each category letter were mean percentage counts (M%C). '[c]' = units for each category letter were percentage counts (%C). '-' = No observation took place.

groups in this setting. They showed related profiles in 15% (2 / 13) and different profiles in 31% (4 / 13) of the groups. The majority of the profiles (69%) were thus the same or related.

However, when the active-task-activity-profiles of girls and boys, respectively, were compared to those of their teachers on a group by group basis they were the *same* in only 15% (2 / 13) of the groups. They were *related* for girls-and-teachers in 31% (4 / 13) and boys-and-teachers in 46% (6 / 13) of the groups. Girls-and-teachers showed *different* profiles in 54% (7 / 13) of groups and boys-and-teachers showed *different* profiles in 39% (5 / 13) of the groups. Overall similar or related profiles were apparent in 46% of comparisons between girls-and-teachers and 61% between boys-and-teachers – less than that between girls and boys recorded in the last paragraph. These results should be viewed with caution, however, given the arbitrary nature of the difference criterion applied when the profiles were created. The significance of these results will be addressed in chapter 6.

5.4.5 TOG active-task-activity-profiles: types and range

The active-task-activity-profiles, discussed in the last section, were then examined in terms of the range of specific types of profile shown by girls, boys and teachers. The resulting breakdown of profile types is shown in Table 5.09. The 'ALL' column in Table 5.09 reveals that boys used a more diverse range of particular active-task-activity-profiles than did the girls. The latter showing a slightly higher use of Using-materials-led profiles than did the former, who, in turn, showed a slightly higher level of Speaking-led profiles.

Table 5.09 Percentage incidence of particular active-task-activity-profile types among girls, boys and teachers in the TOG setting.

	Percentage of observations [a]								
	Girls			Boys			Teacher		
Task-activity-profile	T1 (6)	T2 (7)	**All (13)**	T1 (6)	T2 (7)	**All (13)**	T1 (6)	T2 (7)	**All (13)**
O = S = U	33	14	**23**	67	14	**39**	67	43	**54**
O > S = U					14	**8**			
O = S > U							17	29	**23**
O > U > S	17		**8**	17		**8**			
O = U > S	17	43	**31**		14	**8**			
S > O = U							17	29	**23**
S = U > O				17		**8**			
U > O > S	17	29	**23**		29	**15**			
U > O = S	17	14	**15**		29	**15**			

Note: [a] = Percentage calculations: For each teacher group the percentage number of total observations in which a particular active-task-activity-profile was found is given. Column percentage totals subject to rounding-up error. T1: profiles from T1's groups (a and b), T2: profiles from T2's groups (a and b). Task-activity categories: O = Observing; S = Speaking; U = Using-materials.

Looking at the active-task-activity-profiles within the two classrooms (between values for T1 and T2), different profiles were apparent in both cases, for both pupil-types and with a different emphasis in both classrooms. Among the girls, active-task-activity-profiles were more diverse in classroom T1 than in classroom T2, with the reverse being true for boys. For Teachers, the 'All' column, when compared to the profiles for pupils, showed no use of Using-materials-led profiles, which was not surprising, as they were not undertaking the tasks themselves. Teacher profiles were evenly distributed between Observing-led and Speaking-led types. The two teachers showed a similar range of active-task-activity profiles, with teacher T2 showing more evidence of specific types of profile (**O = S = U**) compared to T1.

5.4.6 From TOG results to TIG results

The next section reports the results for the TIG setting. It also compares them with the results for the TOG setting already presented. In approaching the TIG results what have the TOG results revealed so far?

A number of summary points can be made concerning the TOG data. First, based on their mean percentage counts (M%C) girls and boys, compared within particular categories, showed no statistical differences. This was the case for each of the three observational variables, gesture, gesture-targeting and task-activity. Second, they consistently showed statistical differences between themselves and their teachers (data based on percentage counts) in a number of categories in each of the three variables. In these comparisons pupils sometimes showed higher, or lower counts, than teachers had in particular variable categories. Third, for a few categories, across the dependent variables, girls', boys' and teachers' results showed no statistical differences in the extent to which the category was used. Fourth, similarities between girls and boys were apparent when profiles of their overall use of all the categories for particular variables, in particular tasks, were considered. Nonetheless, small but apparently persistent *differences* in profiles were also apparent across the tasks in these same comparisons. This was the case for all three variables. Last, differences in profile-use were generally the case when teachers were compared with pupils of both genders. However, some profiles were also found to be common in all these comparisons. With these differences in mind the reporting of results now turns to those for the TIG setting.

5.5 TIG Gesture

5.5.1 Gesture counts

Table 5.10 reports the mean counts for girls and boys, and actual counts for teachers, in the twelve Teacher-in-Group (TIG) groups. This data took the same form as that for the TOG results earlier (section 5.2.1). However, unlike the TOG groups, which were all mixed gender groups, four of the TIG groups were girls-only groups (see chapter 4). Figure 5.04 presents the mean of the M%C counts for girls and boys and the %C counts for teachers taken over all the TIG groups as a bar chart, drawing on data from Table 5.10.

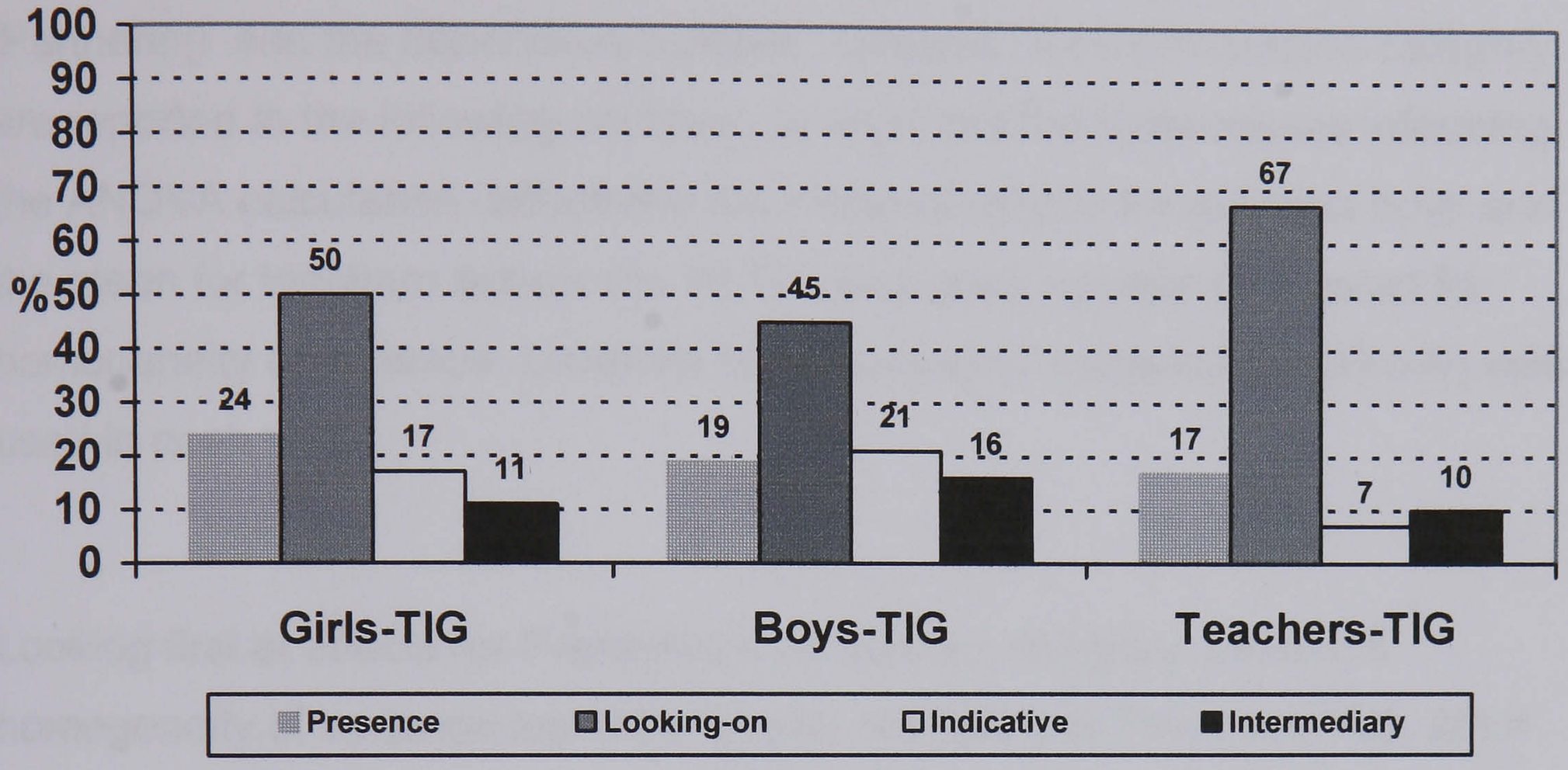
Figure 5.04 shows that for girls and boys, respectively, Looking-on (L) was the most frequently counted category on average, followed by Presence (P), for the girls, and Indicative (I) gestures, for the boys. The Intermediary category (In) was at the lowest levels for both girls and boys. This represented a difference in emphasis compared to pupils in the TOG setting (Figure 5.01) who had Looking-on at much lower levels. Overall mean count levels for the active gesturing categories (where participants 'did something', and so were 'active', rather than refraining from doing something (and so were 'inactive'), were higher in the TIG setting than those in the TOG setting. Pupils in the TIG setting were, in this sense, more gesturally active than those in the TOG setting. However, that increased activity took the form of much more Looking-on gestures (TOG pupils Looked-on less) and more Indicative activity (TOG pupils showed very little Indicative gesture use) rather than Intermediary gestures, which had been much more used in the TOG setting. There was less direct physical interaction between participants, in a gestural sense, in the TIG setting compared to the TOG setting.

Table 5.10 Mean percentage count (M%C) for girls and boys and Percentage count (%C) for teachers in each gesture category, in each TIG group (N = 12).

	Gesture categories											
	Inactive			Active								
	Presence			Looking-on			Indicative			Intermediary		
Group Task	g	b	t	g	b	t	g	b	t	g	b	t
TIG1a												
1[a]	13	[a]	13	61	[a]	72	22	[a]	5	5	[a]	10
2[a]	32	[a]	22	41	[a]	70	17	[a]	0	11	[a]	8
3[a]	22	[a]	24	57	[a]	70	17	[a]	6	4	[a]	0
4[a]	40	[a]	16	44	[a]	74	8	[a]	7	8	[a]	3
TIG1b												
1	21	9	21	44	41	68	11	25	2	25	26	10
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	24	25	2	57	50	84	12	19	15	9	7	0
TIG2a												
1	21	24	38	52	43	31	14	18	12	13	16	20
2	33	36	23	38	31	54	14	12	6	16	21	17
3	14	12	13	45	45	67	37	30	13	5	14	7
4	11	12	11	58	55	69	19	22	7	13	11	14
TIG2b												
1	31	27	12	38	40	75	16	12	3	16	21	10
2	-	-	-	-	-	-	-	-	-	-	-	-
3	22	7	10	62	51	65	13	31	8	4	11	18
4	-	-	-	-	-	-	-	-	-	-	-	-
Total	284	152	205	597	356	799	200	169	84	129	127	117
Groups	12	8	12	12	8	12	12	8	12	12	8	12
Mean[b]	24	19	17	50	45	67	17	21	7	11	16	10

Note: g = Girl pupil; b = Boy pupil; t = Female teacher. **'-'** = No observation took place. [a] = All girl groups. Mean [b] = Arithmetic mean rounded to nearest whole number. All figures rounded to nearest whole count with rounding errors of +/- 1%.

Fig 5.04 Gesture-use in the TIG setting: mean of the mean percentage count (M%C) for girls and boys and mean of the percentage count (%C) for teachers.



***Note*:** There were 12 groups in the TIG setting. Four of these were girls-only groups. Mean counts rounded to nearest whole count with rounding errors of +/- 1%.

Teacher counts in the TIG setting showed Looking-on at the highest mean count level followed by Presence and then Intermediary counts at a lower level. Indicative gesture was the least common gesture type used by teachers in this setting. Teachers Looked-on more than pupils did and showed less indicative gesture use than either type of pupil. Teachers differed from their pupils to a greater extent that did the average girl compared to the average boy across the task groups. The differences in the TIG setting were less marked than those in the TOG setting where participant task roles were more clearly differentiated.

5.5.2 Two-way, between-groups, Independent ANOVA tests: 'Participant-type' X 'Partnering', for categories of TIG 'Gesture'

The results shown in Table 5.10 given earlier were used in a series of Two-way, between-groups, Independent ANOVA tests that are reported below. These tests, using the independent variables, 'Participant-type' and, 'Partnering' and the dependent variable, 'Gesture', for each gesture category are reported in the following sections. In each test the three means informing the ANOVA calculation (effectively the mean-of-means for girls and boys and the mean for teachers across the 12 TIG task groups) were first tested for homogeneity of variance. Levene's homogeneity-of-variance test (H-o-V) was used in each test.

Looking first at effects for **Presence** as a gesture category, Levene's homogeneity of variance test (H-o-V) was not violated; Presence, $F(5, 26) = 0.17$, $p = 0.970$ (exact 'p' values are used where available from the relevant test). There was a non-significant main effect of participant type on extent of Presence, $F(2, 26) = 2.53$, $p = 0.100$, with a medium effect size, $\omega = 0.36$[12], (i.e. different types of participant were showing Presence to similar extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were all similar to each other (girls (g) = 23.67, boys (b) = 19.38 and teachers (t) = 17.08). There was a significant main effect and large effect size for 'Partnering', $F(1, 26) = 7.86$, $p = 0.009$, $\omega = 0.63$ (means; partnering (p) = 25.00 and no-partnering (np) = 17.20) when participant type was not taken into account. Finally, there was a non-significant interaction effect between type of participant and the use of

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[12] In calculating the effect size, the sample size would normally be used. In the current example four groups lacked boys. As a result the samples being compared were: 12 girls, 12 teachers, and 8 boys. To calculate the sample size the *harmonic mean* was used (n = 10.286). This value is lower, and more conservative, than the arithmetic mean of 10.67. It is also the mean used in the calculation of Hochberg's GT2 test for significant difference, itself used in the *post hoc* tests applied to the ANOVA results as the samples sizes were unequal (Field and Hole, 2003, p. 178). For consistency this same harmonic mean was used in the calculation of the related effect size. The effect size may thus also be conservative.

partnering in the task $F(2, 26) = 1.98$, $p= 0.159$, with a medium effect size, $\omega = 0.30$.

Overall, participants showed no difference in the extent of Presence observed in the TIG tasks (Teachers had shown Presence more than pupils in the TOG tasks). Presence was more evident when partnering was part of the task than when it played no part in the task structure at all in this setting, in contrast to that in the TOG setting where partnering showed no effects. The Two-way, between-groups, Independent ANOVA tests reported here suggested that there were no interaction effects between type of participant and the use of partnering for Presence in the TIG setting. This had also been the case in the TOG setting.

Turning now to **Looking-on**, as a category of gesture, Two-way, between-groups, Independent ANOVA tests, involving 'Participant–type', 'Partnering' and 'Looking-on', were undertaken. Levene's H-o-V test showed homogeneity-of-variance for Looking-on, $F(5, 26) = 0.38$, $p = 0.860$. There was a significant main effect of participant type on extent of Looking-on, $F(2, 26) = 12.66$, $p<0.0005$, with a large effect size, $\omega = 0.73$; (i.e. different types of participant were showing Looking-on to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and lower than that of their teachers (g = 49.75, b = 44.50 and t = 66.58). Hochberg's GT2 post hoc tests[13] showed that girls' and boys' means were significantly different to those of their teachers (g: $p = 0.002$, b: $p<0.0005$) but not to each other ($p = 0.639$). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 0.51$, $p = 0.823$, $\omega = 0$, (p = 55.83 and np = 54.10) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.93$, $p= 0.407$, $\omega = 0$.

[13] For all the Hochberg's GT2 post hoc tests, in the TIG setting, the harmonic mean sample size used was 10.286.

Overall, pupils showed significantly less Looking-on in the TIG groups than did their teachers (the reverse was the case in the TOG groups). Girls and boys, when compared to each other, showed no such difference (as had been the case in the TOG groups). Partnering did not appear to have any effect in the TIG setting. In contrast, there had been greater mean use of Looking-on when no-partnering was a feature of the tasks in the TOG setting. In both settings no interaction effects, between participant-type and the use of partnering in the task, were apparent.

The third category of gesture to be examined using Two-way, between-groups, Independent ANOVA tests was that for **Indicative** gestures. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 26) = 0.78$, $p = 0.572$. There was a significant main effect of participant type on extent of Indicative gesture, $F(2, 26) = 9.79$, $p=0.001$, with a large effect size, $\omega = 0.69$; (i.e. different types of participant were showing Indicative gestures to different extents if 'Partnering' was ignored). When means were examined it was apparent that girls' and boys' means were similar to each other and larger than that for the teachers (g = 16.67, b = 21.13 and t = 7.00). Hochberg's GT2 post hoc tests showed that girls' and boys' means were significantly different to those of their teachers (g: $p = 0.003$, b: $p<0.0005$) but not to each other ($p = 0.342$).There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 3.19$, $p = 0.086$, with a medium effect size, $\omega = 0.42$ (p = 11.08 and np = 16.00) when participant type was not taken into account. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.77$, $p= 0.471$, $\omega = 0$.

Overall, in the TIG setting, pupils showed more evidence of Indicative gestures than did their teachers (in contrast no significant differences were apparent between any participant types in the TOG setting). In both TOG and TIG settings the use of partnering did not appear to affect levels of Indicative gesture use. There was also no apparent interaction between participant type and the use of partnering in a task, when Indicative gestures were examined, in either setting.

Further Two-way, between-groups, Independent ANOVA tests were used to examine the extent to which **Intermediary** gestures were apparent in the TIG setting tasks. These involved the same independent variables reported above. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 26) = 0.71$, $p = 0.624$. There was a non-significant main effect of participant type on extent of Intermediary gestures, $F(2, 26) = 1.78$, $p = 0.188$, with a small-medium effect size, $\omega = 0.27$; (i.e. different types of participant were not showing Intermediary gestures to different extents when 'Partnering' was ignored). When means were examined it was apparent that girls', boys' and teachers' means were all similar to each other (g = 10.92, b = 15.88 and t = 9.75). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 2.36$, $p = 0.137$, with a medium effect size, $\omega = 0.34$ (p = 8.75 and np = 13.50) when participant type was not taken into account. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.53$, $p = 0.594$, $\omega = 0$.

Overall, the TIG results for Intermediary gesture use showed no difference among girls, boys or teachers (TOG pupils, in contrast, had shown significantly more Intermediary gesture use than their teachers). The variable 'Partnering' showed no apparent effect in relation to Intermediary gesture use in both settings. There was also no evidence of interaction effects between participant-type, the use of partnering, and the use of Intermediary gestures in either setting.

Taken together, across the gesture categories and settings, the gesture results suggested that girls and boys, in both TOG and TIG groups[14], were showing similar mean M%C count levels for each gesture category. Differences, where they occurred, were between pupils and teachers in both settings. TOG teachers had shown Presence more than their pupils while in

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[14] Pool data results: As above but boys and girls showed a difference for Intermediary gesture (boys used more than girls, $p = 0.002$), but separately showed no difference compared to their teachers. The same applied for the KW results with boys using more than girls, $p < 0.003$). See Appendix 8, Tables 8.07 and 8.14.

the TIG setting no such differences were apparent. TOG pupils used Looking-on more than their TOG teachers did, the reverse being so in the TIG setting. In the TOG setting teachers and pupils had used Indicative gestures to a similar extent. In contrast, in the TIG setting, pupils had shown this form of gesture more than their teachers. The use of partnering in a task had limited effects in both settings. For Presence, partnering showed no effects in the TOG setting but was more apparent when partnering was part of the task in the TIG setting. In contrast, in the TOG setting, Looking-on had been more apparent when no-partnering was a part of the task while in the TIG setting no effects in relation to partnering were apparent. Indicative and Intermediary gestures appeared unaffected by partnering, or its lack, in both settings. There were no interaction effects between the variables 'Participant type', 'Partnering' and particular categories of 'Gesture' in either setting.

5.5.3 TIG gesture-profiles

Gesture-profiles based on the relative M%C and %C of participant types, as carried out before (section 5.2.7), were created for the TIG gesture data. These were summarised in Table 5.11. From this table it was apparent that the majority of the profiles for girls, boys and teachers were Looking-on-led (they had been predominantly Presence-led in the TOG setting).

In addition, girls-and-boys had the same gesture profiles in 50% (4 / 8) of the groups. In only one of these same tasks did girls or boys have the same profile as their teachers (there had been none in the TOG setting). Among the girls-only groups none of the groups had common profiles with their teachers. For all the groups, this was interesting because the teachers were part of the task in the TIG setting (unlike the TOG setting). Teacher and pupil activity overlapped in these tasks so a greater degree of similarity might have been expected. This will be pursued in Chapter 6 when results are examined further.

Table 5.11 Gesture-profiles (representing relative prevalence of category counts) for girls, boys and teachers, in the TIG groups (N = 12).

Group		Gesture-profiles [a]		
		Girls[b]	Boys[b]	Teacher[c]
TIG1a				
	1	**L > P = I > In**	[d]	**L > P = I = In**
	2	**P = L > I = In**	[d]	**L > P > In > I**
	3	**L > P = I > In**	[d]	**L > P > I = In**
	4	**P = L > I = In**	[d]	**L > P = I = In**
TIG1b				
	1	**L > P = I = In**	**L > I = In > P**	**L > P > I = In**
	2	-	-	-
	3	-	-	-
	4	**L > P > I = In**	**L > P = I > In**	**L > I > P = In**
TIG2a				
	1	**L > P = I = In**	**L > P = I = In**	**P = L > I = In**
	2	**P = L > I = In**	**P = L > I = In**	**L > P = In > I**
	3	**L > I > P = In**	**L > I > P = In**	**L > P = I = In**
	4	**L > P = I = In**	**L > P = I = In**	**L > P = I = In**
TIG2b				
	1	**P = L > I = In**	**L > P = I = In**	**L > P = I = In**
	2	-	-	-
	3	**L > P = I > In**	**L > I > P = In**	**L > P = I = in**
	4	-	-	-

Note: [a] = The linear sequence of letters in each profile starts with the most prevalent category and ends with the least prevalent category. The symbols in-between the letters either show that the preceding category was more prevalent than the one following ('>') or that they were of equivalent prevalence ('='). Where two or more values were at, or within, 10% of each other they were taken to be equivalent. The letter coding for the gesture categories were: P = Presence; L= Looking-on; I=Indicative; In= Intermediary. A category letter in bold print indicated an 'active' gesture category. [b] = units for each category letter were mean percentage counts (M%C). [c] = units for each category letter were percentage counts (%C). [d] = No boys in the group. '-' = No observation took place.

5.5.4 Active-gesture-profiles

If Presence was removed from the gesture-profile (by focusing on the bold print categories of **L, I** and **In** in Table 5.11 below), active-gesture-profiles became apparent. These showed an increased commonality in profile between girls and boys. Classifying the profiles into *same, related and different* for the eight groups, involving both girls and boys, revealed that girls and boys had the *same* profiles in 88% of the tasks (7 / 8) and *related* profiles in 13% of the tasks (1 / 8). There were no *different* profiles. This marked an increase in the extent of *same* and *related* profiles compared to the TOG setting.

Comparing pupils and teacher; girls-and-teachers had 50% (4 / 8) *same* profiles, 50% (4 / 8) *related* profiles, and no *different* profiles. Boys-and-teachers showed 63% (5 / 8) *same* profiles, 38% (3 / 8) *related* profiles and no *different* profiles (1 / 8). There were, in addition, four groups in which there were no boys (TIG1a 1-4): 25% (1/4) were the *same* profile, 75% (3 / 4) a *related* profile. There were no *different* profiles.

Overall girls and teachers had the *same* profile in 42% (5 / 12) of the TIG groups, *related* profiles in 58% (7 / 12) and no *different* profiles, thus all the groups were the *same* or *related.* The boys' results also showed that all the groups were the same or related. In both cases there was more similarity than in the TOG setting (70%). The profile patterns of participants were much more similar to each other in the TIG setting than they had been in the TOG setting. However, this result is conditional upon noting the arbitrary nature of the different criteria used in constructing the profiles in question.

5.5.5 TIG active-gesture-profiles: types and range

The range and types of active-gesture-profiles noted in the TIG setting are shown in Table 5.12. It reveals that just *three types* of profile characterised all the active-gesture-profiles used in this setting by girls, boys and teachers. This was in marked contrast to the seven types apparent in the TOG setting.

Table 5.12 Percentage incidence of particular active-gesture-profile types among girls, boys and teachers in the TIG setting.

	Percentage of observations [a]								
	Girls			Boys			Teacher		
Gesture -profile	T1 (6)	T2 (6)	**All (12)**	T1 (2)	T2 (6)	**All (8)**	T1 (6)	T2 6)	**All (12)**
L > I > In	33	17	**25**	50	33	**38**	17		**8**
L > I = In	67	83	**75**	50	67	**63**	67	83	**75**
L > In > I							17	17	**17**

Note: [a] = Percentage calculations: For each teacher group the percentage number of total observations in which a particular active-gesture-profile was found is given. Column percentage totals subject to rounding-up error. T1: patterns from T1's groups (a and b), T2: patterns from T2's groups (a and b). Gesture categories: L = Looking-on gestures; I = Indicative gestures; In = Intermediary gestures.

Focusing for a moment on the 'All' columns, the emphasis within the girls' profiles was towards Looking-on and equivalent levels of Indicative gesture and Intermediary–led profiles while those of the boys was more towards Looking-on-led and Indicative then Intermediary–led profiles. For the girls in the groups *without* boys 50% (2 / 4) showed the **L > I > In** profile and 50% (2 / 4), the **L > I = In,** suggesting a difference in approach within the tasks.

For the teachers, Looking-on-led profiles with equivalent levels for Indicative and Intermediary-led profiles were the most common, with both teachers

showing an equivalent use of Looking-on followed by Intermediary-led patterns, arguably reflecting their role in leading the tasks and distributing materials, as needed, during the task. In the process, this distribution would have involved explaining the purpose and significance of the materials in a way that did not occur in the TOG setting. However, the two teachers differed in profiles with T2 using the **L > In = I** pattern to a much greater extent than her colleague, T1. These will be examined further in chapter 6.

5.6 TIG gesture-targets

5.6.1 Gesture-targeting counts

Data for gesture-targeting by the various types of participants in the TIG setting groups (N = 12) was reported in Table 5.13 on the same basis as the TOG groups (section 5.3.1). The mean of the mean counts of girls and boys (as M%C) and the mean for teachers (%C) across all the TIG groups was calculated using the data from Table 5.13 and is shown as a bar chart in Figure 5.05.

From Figure 5.05 both girls and boys had Targeting-to-People as their highest incidence of mean counts. For both girls and boys Targeting-to-People-and-materials was marginally less frequent, as were Targeting-to-Materials and finally, No-targeting at all. Active targeting by girls and boys was more frequent in the TIG setting than the TOG setting (No-targeting for girls and boys was at a higher level in the TOG setting).

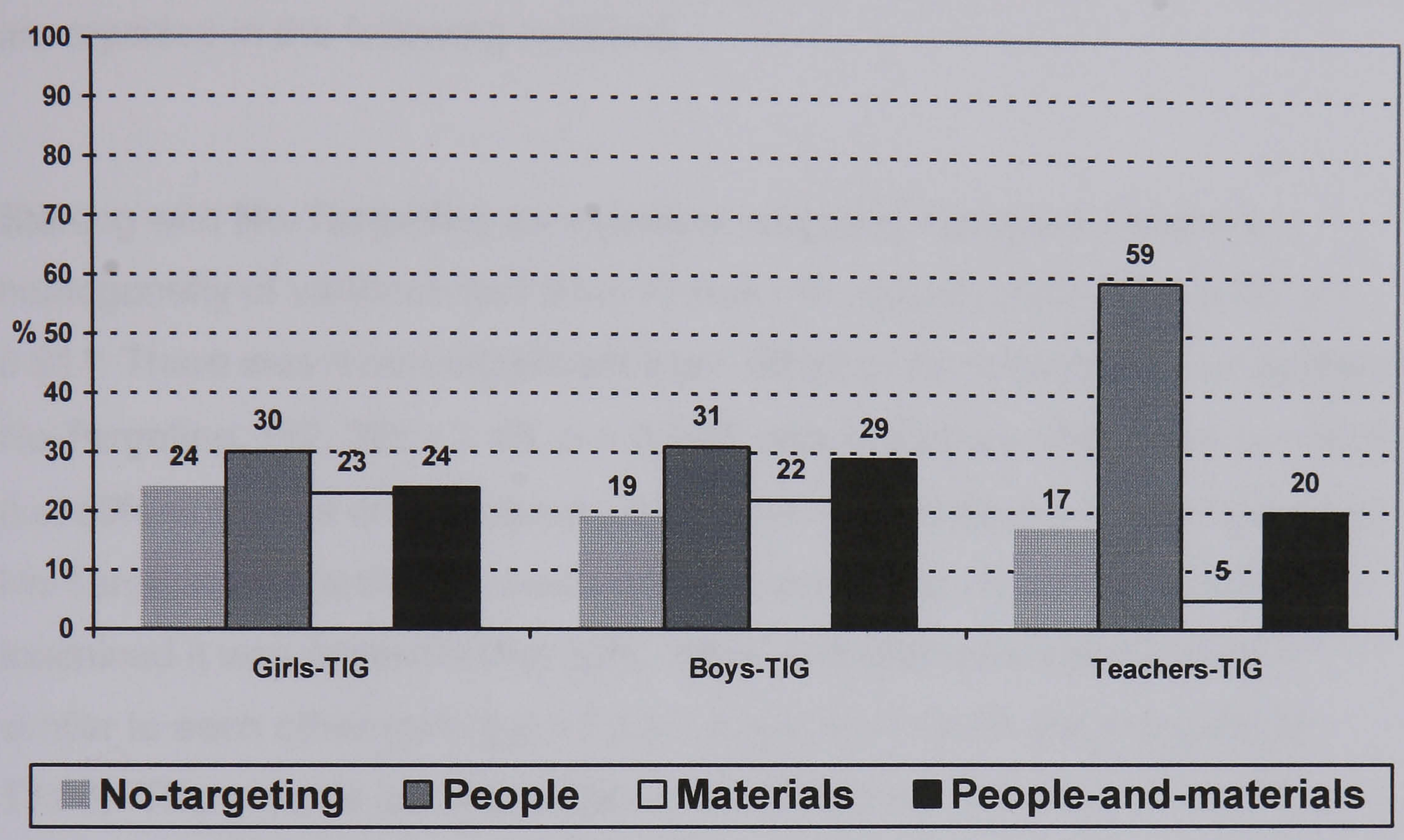
The TIG teachers who, from Figure 5.05, were showing Targeting-to-People as their most counted category were also Targeting-to-People-and-materials and No-Targeting as their next most frequent categories. Targeting-to-Materials was least targeted. In contrast, the TOG teachers had the highest

Table 5.13 Mean percentage count (M%C) for girls and boys and Percentage count (%C) for teachers in each gesture-targeting category, in each TIG group (N = 12).

	Gesture-target categories											
	Inactive			Active								
	No-targeting			People			Materials			People-and-materials		
Group / Task	g	b	t	g	b	t	g	b	t	g	b	t
TIG1a												
1[a]	13	[a]	13	32	[a]	57	29	[a]	6	27	[a]	24
2[a]	32	[a]	22	27	[a]	63	17	[a]	2	25	[a]	13
3[a]	22	[a]	24	21	[a]	65	31	[a]	3	26	[a]	9
4[a]	41	[a]	16	20	[a]	69	17	[a]	0	22	[a]	16
TIG1b												
1	21	9	21	24	35	54	20	12	6	36	45	19
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	24	26	2	37	35	78	21	23	6	19	17	15
TIG2a												
1	21	24	38	36	35	40	28	25	5	16	17	18
2	33	36	23	33	25	54	15	16	6	20	23	17
3	14	12	13	36	35	73	19	20	1	31	34	13
4	11	12	11	34	27	51	27	31	5	29	31	33
TIG2b												
1	31	27	12	23	24	57	26	23	8	21	25	24
2	-	-	-	-	-	-	-	-	-	-	-	-
3	22	7	10	32	33	50	27	24	7	20	36	34
4	-	-	-	-	-	-	-	-	-	-	-	-
Total	285	153	205	355	249	711	277	174	55	292	228	235
Groups	12	8	12	12	8	12	12	8	12	12	8	12
Mean [b]	24	19	17	30	31	59	23	22	5	24	29	20

Note: g = Girl pupil; b = Boy pupil; t = Female teacher. **'-'** = No observation took place. '[a]' = All girl groups. Mean [b] = Arithmetic mean rounded to nearest whole number. All figures rounded to nearest whole count with rounding errors of +/- 1%.

Fig 5.05 Gesture-targeting in the TIG setting: mean of the mean percentage count (M%C) for girls and boys and mean of the percentage count (%C) for teachers.



Note: There were 12 groups in the TIG setting. Four of these were girls-only groups. Mean counts rounded to nearest whole count with rounding errors of +/- 1%..

mean counts in the No-Targeting category, with Targeting-to-People the next most common category. They also, like the TIG teachers, Targeted-to-Materials the least of all among their count categories. In terms of averages, as had been the case for gesture within settings, teachers and pupils showed more differences in targeting than did girls and boys in the same settings.

5.6.2 Two-way, between-groups, Independent ANOVA tests: 'Participant-type' X 'Partnering', for categories of TIG 'Gesture-targets'

Using the data contained in Table 5.13, a series of Two-way, between-groups, Independent ANOVA tests involving 'Participant type' and 'Partnering' as the independent variables, and the various categories, in turn, of the variable 'Gesture-targets' as the dependent variable, were undertaken. These are reported in the following sections.

Starting with **No-Targeting** as a gesture-targeting category, Levene's homogeneity of variance test (H-o-V) was not violated; $F(5, 26) = 0.30$, $p = 0.911$. There was a non-significant main effect of participant type on extent of No-Targeting, $F(2, 26) = 2.46$, $p = 0.105$, with a medium effect size, $\omega = 0.35$, (i.e. different types of participant were showing no difference in the extent of No-Targeting if 'Partnering' was not taken into account). When means were examined it was apparent that girls', boys' and teachers' means were all similar to each other (girls (g) = 23.75, boys (b) = 18.75 and teachers (t) = 17.08). There was a just significant main effect for 'Partnering', $F(1, 26) = 7.29$, $p = 0.012$, with a large effect size, $\omega = 0.62$ (means; partnering (p) = 24.83 and no-partnering (np) = 17.10) when participant type was not taken into account. From the means it appeared that No-targeting was occurring more when partnering was part of the task than when it was not. Finally, there was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 1.82$, $p= 0.182$, with a small-medium effect size, $\omega = 0.27$.

Overall, in contrast to teachers in the TOG setting, who showed significantly more No-Targeting than did their pupils, no differences were apparent between pupils and teachers in the TIG setting. When partnering was part of the task, No-targeting was more apparent than when it was not (in contrast, partnering in the task had had no apparent effect in the TOG setting). In neither setting were any interaction effects apparent between participant-type, use of partnering and No-targeting.

Turning next to **Targeting-to-People**, as a category of gesture-targeting, Two-way, between-groups, Independent ANOVA tests, involving 'Participant–type', 'Partnering' and 'Looking-on', were undertaken. Levene's H-o-V test showed homogeneity-of-variance for Looking-on, $F(5, 26) = 0.36$, $p = 0.869$. There was a significant main effect of participant type on extent of Targeting-to-People, $F(2, 26) = 57.74$, $p<0.0005$, with a large effect size, $\omega = 0.92$; (i.e. different types of participant were showing Targeting-to-People to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and smaller than that of their teachers (g = 29.58, b = 31.13 and t = 59.25). Hochberg's GT2 post hoc test showed that girls' and boys' means were very significantly different to those of their teachers (both *ps* <0.0005) but not to each other ($p = 0.957$). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 0.53$, $p = 0.475$, $\omega = 0$, (p = 43.92 and np = 39.40) when participant type was not taken into account. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 3.08$, $p= 0.063$, with a large effect size, $\omega =$ 0.69.

Overall, TIG pupils showed significantly less Targeting-to-People than did their teachers (in the TOG groups the reverse was the case). Girls and boys in both settings, when compared to each other, showed no such differences. The use of partnering in the task had no apparent effect on levels of Targeting-to-People in either setting. Equally there were no interaction effects between participant-type, use of partnering and extent of Targeting-to-People in either setting.

The third category of gesture-targeting to be examined in the TIG setting, using Two-way, between-groups, Independent ANOVA tests, was that for **Targeting-to-Materials**. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 26) = 1.49$, $p = 0.226$. There was a significant main effect of participant type on extent of Targeting-to-Materials, $F(2, 26) = 52.80$, $p<0.0005$, with a large effect size, $\omega = 0.91$, (i.e. different types of participant

were showing Targeting-to-Materials to very different extents if 'Partnering' was ignored). When means were examined it was apparent that girls' and boys' means were similar to each other and much greater than that of their teachers (g = 23.17, b = 21.88 and t = 4.67). Hochberg's GT2 post hoc test showed that girls' and boys' means were significantly different to those of their teachers (both *ps* <0.0005) but not to each other (*p* = 0.900). There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 3.107$, $p = 0.090$, with a medium-large effect size, $\omega = 0.41$ (p = 13.25 and np = 17.50) when participant type was not taken into account. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.25$, $p = 0.777$, $\omega = 0$.

Overall, pupils showed significantly more Targeting-to-Materials in the TIG groups than did their teachers (as had been the case for the TOG groups). Girls and boys, when compared to each other, showed no such difference. Partnering in the task had no apparent effect in relation to Targeting-to-Materials across the TIG groups (in contrast, Targeting-to-Materials had been more evident when partnering was *not* part of the task structure in the TOG setting). There were no apparent interactions between 'Participant-type' and 'Partnering', when Targeting-to-Materials was examined, in either setting.

Further Two-way, between-groups, Independent ANOVA tests were used to investigate **Targeting-to-People-and-materials** in the TIG setting. These involved the same independent variables reported above. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 26) = 1.38$, $p = 0.264$. There was a non-significant main effect of participant type on extent of Targeting-to-People-and-materials, $F(2, 26) = 2.93$, $p = 0.071$, with a medium-large effect size, $\omega = 0.40$, (i.e. different types of participant were not showing Targeting-to-People-and-materials to different extents when 'Partnering' was ignored). When means were examined it was apparent that girls', boys' and teachers' means were all similar to each other (g = 24.75, b = 28.63 and t = 19.58). There was a significant main effect for 'Partnering' as a variable, $F(1, 26) = 9.89$, $p = 0.004$, with a large effect size, $\omega = 68$ (p = 18.58 and np = 26.90)

when participant type was not taken into account. Examination of the means suggested that Targeting-to-People-and-materials were more prevalent when partnering was not part of the task structure. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.860$, $p= 0.435$, $\omega = 0$.

Overall, pupils and teachers in the TIG groups showed no difference in extent of Targeting-to-People-and-materials (in contrast, pupils had shown more Targeting-to-People-and-materials in the TOG groups than did their teachers). Girls and boys, when compared to each other, showed no differences in either setting. In the TIG setting, Targeting-to-People-and-materials was more apparent when the task did not involve partnering, while, in the TOG setting, no effects had been noted. There were no apparent interactions between 'Participant-type' and 'Partnering', when Targeting-to-People-and-materials was examined, in either setting.

Overall, across the groups in both settings, the gesture-targeting results suggested that girls and boys were showing similar mean M%C count levels for each targeting category. Differences, where they occurred, were between pupils and teachers. Teachers used more No-Targeting than pupil-types in the TOG setting while there were no apparent differences in level of use in the TIG setting[15]. Pupils showed more Targeting-to-People in the TOG setting than their teachers had, but this was reversed in the TIG setting. In both TOG and TIG settings, pupils showed more Targeting-to-Materials than their teachers had. Pupils in the TOG setting had Targeted-to-People-and-materials more than their teachers had but no such differences were apparent in the TIG setting.

When 'No-Targeting' was considered in the context of partnering (or its lack), there were no apparent effects in the TOG setting, but in the TIG setting it was found to be more prevalent when partnering was part of the task. No

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[15] Pool data gesture-targets: as main results. KW data: as main results. See Appendix 8, Tables 8.08 and 8.15.

effects associated with 'Partnering' in either setting were apparent in relation to Targeting-to-People. Targeting-to-Materials was more apparent in the TOG setting when tasks did not involve partnering, while no effects were seen among the TIG groups. In the TOG setting, Targeting-to-People-and-materials was not affected by partnering, but in the TIG setting levels of Targeting-to-People-and-materials were higher when the task did not involve partnering. No interaction effects between participant-type, the use of partnering or the categories of gesture-targeting, were found in the TOG and TIG settings.

5.6.3 TIG gesture-targeting-profiles

Following the same procedure as described for gesture-targeting-profiles in the TOG groups (section 5.3.5), profiles were created from the TIG group data in Table 5.13. These are shown in Table 5.14. In 50% (4 / 8) of the observations, girls' and boys' gesture-targeting-profiles were the same, the balance being different. This was lower than had been the case in the TOG setting. The 50% (4 / 8) tasks where profiles were different contrasted with the statistical results for particular categories presented earlier. These showed no difference between girls and boys on the frequency of individual types of targeting. In no instances did either girls, or boys, show the same profile as their teacher (all different): in the TOG setting only the girls had shown one instance of a common profile. In the four observations lacking boys in the group, there were no profiles in common between the girls and teachers. Even so, as with the gesture-profiles, particular profiles recurred across groups for all three participant types. However, given the arbitrary basis of the difference criterion used in compiling the profiles, these results, overall, need to be treated with caution.

Table 5.14 Gesture-targeting profiles (representing relative prevalence of category counts) for girls, boys and teachers, in the TIG groups (N = 12).

	Gesture-targeting profiles [a]		
Group	Girls[b]	Boys[b]	Teacher[c]
TIG1a			
1	**P = M = Pm** > N	[d]	**P > Pm** > N > **M**
2	N = **P = M = Pm**	[d]	**P** > N = **M = Pm**
3	N = **P = M = Pm**	[d]	**P** > N > **Pm = M**
4	N > **P = M = Pm**	[d]	**P** > N = **Pm > M**
TIG1b			
1	**Pm** > N = **P = M**	**P = Pm** > N = **M**	**P** > N = **Pm > M**
2	-	-	-
3	-	-	-
4	**P** > N = **M = Pm**	N = **P = M > Pm**	**P > Pm** > N = **M**
TIG2a			
1	N = **P = M = Pm**	N = **P = M = Pm**	N = **P > Pm > M**
2	N = **P > M = Pm**	N = **P = M = Pm**	**P** > N = **Pm > M**
3	**P = Pm** > N = **M**	**P = Pm** > N = **M**	**P** > N = **Pm > M**
4	**P = M = Pm** > N	**P = M = Pm** > N	**P > Pm** > N = **M**
TIG2b			
1	N = **P = M = Pm**	N = **P = M = Pm**	**P > Pm** > N = **M**
2	-	-	-
3	N = **P = M = Pm**	**P = Pm > M** > N	**P > Pm** > N = **M**
4	-	-	-

Note: [a] = The linear sequence of letters in each profile starts with the most prevalent category and ends with the least prevalent category. The symbols in-between the letters either show that the preceding category was more prevalent than the one following ('>') or that they were of equivalent prevalence ('='). Where two or more values were at, or within, 10% of each other they were taken to be equivalent. The letters coding for the gesture-targeting categories were: N = No-targeting; P = Targeting-to-People; Targeting-to-Materials; Pm = Targeting-to-People-and-Materials. A category letter in bold print indicated an 'active' gesture-targeting category. [b] = units for each category letter were mean percentage counts (M%C). [c] = units for each category letter were percentage counts (%C). [d] = No boys in the group. '-' = No observation took place.

5.6.4 Active-gesture-targeting-profiles

Focusing now on the bold print targeting categories, in Table 5.14, identified active-gesture-targeting-profiles (see section 5.3.6). Looking at the extent to which these profiles were the '*same*', '*related*' or '*different* ' showed, for girls-and-boys, where both were present in the group, that *same* gesture-targeting profiles were at 50% (4 / 8), 50% (4 / 8) were *related* and none were *different* This represented an increase in the *same* or *related* total compared to the TOG setting (85%). In the TIG setting girls and boys had more profiles in common.

When girls and boys, respectively, were compared to teachers, their profiles showed marked differences. Girls-and-teachers had only no tasks with the *same* profile, and one (13%:1 / 8) *related profiles* – same and related together being 13%; in the TOG setting this had been 70%. The rest were *different* (88%:7/8 –with rounding errors). Boys-and-teachers showed a similar pattern but with a marginally greater degree of difference: no *same* profile, *related profile*, 25% (2 / 8) – same and related together being 25%; in the TOG setting this had been 77%. The rest were *different*, 75% (6 / 8). A lack of similarity between girls-and-teachers was also apparent in the boy-less groups: *same* profile 0%, *related*, 25% (1 / 4) and *different*, 75% (3 / 4). Overall it was apparent that targeting profiles between the three types of participants were showing more difference in the TIG setting than in the TOG setting. However, the caution given earlier about the status of these results is once more invoked here.

5.6.5 TIG active-gesture-targeting-profiles: types and range

Counting the frequency of particular profile types among participants in the TIG setting, on the same basis as those in the TOG setting (see section 5.3.7), produced the results summarised in Table 5.15.

Table 5.15 Percentage incidence of particular active-targeting-profile types among girls, boys and teachers in the TIG setting.

	Percentage of observations [a]								
	Girls			Boys			Teacher		
Gesture-target-profile	T1 (6)	T2 (6)	**All (12)**	T1 (2)	T2 (6)	**All (8)**	T1 (6)	T2 (6)	All (12)
P = M = Pm	67	67	**67**		67	**50**			
P > M = Pm	17	17	**17**				17		**8**
P = M > Pm				50		**13**			
P > Pm > M							67	100	**83**
P > Pm = M							17		**8**
P = Pm > M		17	**8**	50	33	**38**			
Pm > P = M	17		**8**						

Note: [a] = **Percentage calculations**: For each teacher group the percentage number of total observations in which a particular active-targeting-profile was found is given. Column percentage totals subject to rounding-up error. **T1:** patterns from T1's groups (a and b), **T2:** patterns from T2's groups (a and b). **Gesture -targeting categories**: P = People; M = Materials; Pm = People-and-materials.

In Table 5.15, boys showed a slightly narrower of profile types (the '**ALL**' columns) than was apparent for the girls. Girls' profiles tended to be Targeted-to-People and then to-materials and people-and-materials to similar extents. Boys showed a different emphasis, Targeting-to-People and then to-Materials or People-and-materials. In both classrooms, boys tended to have more profiles Targeting-People-and-materials (and Targeting-to-People) to a greater extent than did the girls. Both teachers mainly showed the **P > Pm > M** type targeting-profile, with teacher T2 using this profile exclusively. In the Tog setting the **P = M = Pm** and **P > M = Pm** profile had been mainly used by teachers. This difference in emphasis could suggest an order of attention, related to and informed by, their pedagogic role in each setting. The TOG teachers were supplying materials to the task, and secondarily working with pupils. The TIG teachers, on the other hand, were working directly with pupils,

mediating their use of materials, rather than simply supplying materials (see chapter 6).

5.7 TIG task-activity

5.7.1 Task-activity counts

The third observational variable was that of task-activity. A summary of the total mean counts for girls and boys (and actual total counts for teachers) in each task group for the TIG groups (N = 12) is presented in Table 5.16. It was calculated on the same basis as that for the TOG setting (section 5.4.1). A bar chart, based on the data in Table 5.16 and showing the mean of the means (for girls and boys) and mean (for teachers) across task groups, for each category, as in section 5.4.1 for the TOG setting, is shown in Figure 5.06.

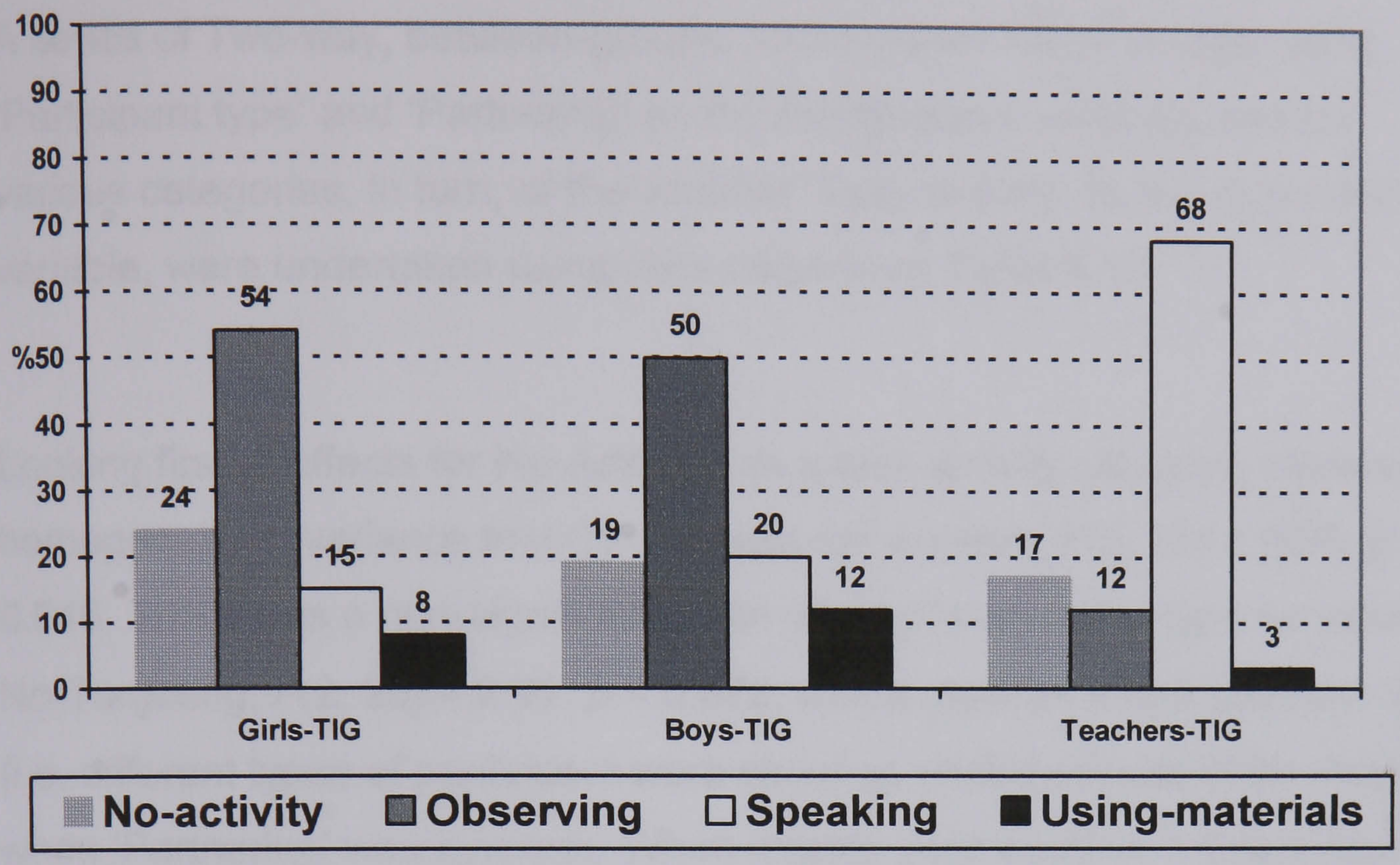
From this bar chart (Fig.5.06), both girls and boys showed Observing as the most counted category (TOG girls and boys had shown much lower levels of Observing, with less use of Speaking and higher levels of Using-materials. For TIG girls and boys No-activity, and Speaking were at similarly lower levels with Using-materials, in both cases, at much lower levels than their TOG equivalents. TIG girls and boys predominantly *observed* their task-activity. Those in the TOG setting engaged with their task directly Using-materials. In this sense, although the TIG girls and boys showed more task-related activity, they were actually less personally active in the prosecution of the task itself. The teachers in the TIG setting, on the other hand, were much more directly engaged in the task itself, principally through Speaking, rather than as an inactive presence (high levels of No-task-activity) as they had been in the TOG setting. TIG teachers showed much lower levels of the No-activity

Table 5.16 Mean percentage count (M%C) for girls and boys and Percentage count (%C) for teachers in each task-activity category, in each TIG group (N = 12).

	Task-activity categories											
	Inactive			Active								
	No-activity			Observing			Speaking			Using-materials		
Group Task	g	b	t	g	b	t	g	b	t	g	b	t
TIG1a												
1[a]	14	[a]	14	74	[a]	14	9	[a]	68	4	[a]	4
2[a]	32	[a]	25	47	[a]	3	14	[a]	72	7	[a]	0
3[a]	23	[a]	24	61	[a]	19	15	[a]	58	2	[a]	0
4[a]	40	[a]	16	37	[a]	12	20	[a]	71	3	[a]	2
TIG1b												
1	22	9	19	45	40	13	17	30	66	17	20	2
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	24	25	2	55	53	15	15	18	84	6	7	0
TIG2a												
1	20	23	37	56	49	20	8	8	34	17	21	9
2	34	36	23	32	33	10	22	19	62	13	11	5
3	15	12	13	59	55	12	22	27	74	4	6	1
4	13	12	12	65	63	4	14	19	75	8	7	8
TIG2b												
1	31	27	12	50	48	9	12	20	78	8	6	1
2	-	-	-	-	-	-	-	-	-	-	-	-
3	23	11	11	62	55	11	9	19	73	6	15	5
4	-	-	-	-	-	-	-	-	-	-	-	-
Total	291	155	208	643	396	142	177	160	815	95	93	37
Groups	12	8	12	12	8	12	12	8	12	12	8	12
Mean [b]	24	19	17	54	50	12	15	20	68	8	12	3

Note: g = Girl pupil; b = Boy pupil; t = Female teacher. '-' = No observation took place. '[a]' = All girl groups. Mean [b] = Arithmetic mean rounded to nearest whole number. All figures rounded to nearest whole count with rounding errors of +/- 1%.

Fig 5.06 Task-activity in the TIG setting: mean of the mean percentage count (M%C) for girls and boys and mean of the percentage count (%C) for teachers.



***Note*:** There were 12 groups in the TIG setting. Four of these were girls-only groups. Mean counts rounded to nearest whole count with rounding errors of +/- 1%.

category than did their TOG counterparts, equally, both TOG and TIG teachers showed similarly low levels of Using-materials. In the former this is not surprising given their role, in supporting the task, whilst being absent from the task-activity itself. More surprisingly, the teachers actively involved in the task-activity in the TIG setting, interacted directly with the task materials at a very low level. This perhaps reflected the strongly speech mediated aspect of their role, in this setting, as will be discussed later in chapter 6. For the task-activity variable, girls and boys in the two settings showed few differences when compared to each other in each setting. In contrast, when compared to their teachers, differences were apparent in both settings.

5.7.2 Two-way, between-groups, Independent ANOVA tests: 'Participant-type' X 'Partnering', for categories of TIG 'Task-activity'

A series of Two-way, between-groups, Independent ANOVA tests using 'Participant type' and 'Partnering' as the independent variables and the various categories, in turn, of the variable 'Task-activity' as the dependent variable, were undertaken using data taken from Table 5.16.

Looking first at effects for **No-Activity** as a task-activity category, Levene's homogeneity of variance test (H-o-V) was not violated; $F(5, 26) = 0.23$, $p = 0.946$. There was a non-significant main effect of participant type on extent of No-Targeting, $F(2, 26) = 2.92$, $p = 0.072$, with a medium effect size, $\omega = 0.40$ (i.e. different types of participant were showing similar extents of No-Activity when 'Partnering' was ignored). When means were examined it was apparent that girls', boys' and teachers' means were all very similar to each other (girls (g) = 24.33, boys (b) = 19.38 and teachers (t) = 17.33). There was a very significant main effect for 'Partnering', $F(1, 26) = 8.69$, $p = 0.007$, with a large effect size, $\omega = 0.65$ (means; partnering (p) = 25.42 and no-partnering (np) = 17.50) when participant type was not taken into account. Examining the means suggested that No-Activity was more apparent when partnering was a part of the task structure. Finally, there was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 1.91$, $p= 0.169$, with a small effect size, $\omega = 0.29$.

Overall, teachers and pupils showed similar extents of No-Activity in the TIG setting (in contrast to the TOG setting where teachers showed significantly more No-Activity than did their pupils who, when compared to each other, showed no such difference). In the TIG setting, higher levels of No-Activity were apparent when partnering was part of the task, while in the TOG setting partnering had no apparent effect on No-Activity levels. In neither setting was there any evidence of interaction effects between participant-type, use of partnering and levels of No-Activity.

Looking next at **Observing**, as a category of task-activity, Two-way, between-groups, Independent ANOVA tests, involving 'Participant–type', 'Partnering' and 'Observing', were undertaken. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 26) = 1.68$, $p = 0.175$. There was a significant main effect of participant type on extent of Observing, $F(2, 26) = 72.60$, $p < 0.0005$, with a large effect size, $\omega = 0.94$; (i.e. different types of participant were showing Observing to very different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other and greater than that of their teachers (g = 53.83, b = 49.50 and t = 11.83). Hochberg's GT2[16] post hoc test showed that girls' and boys' means were very significantly different to those of their teachers (both *ps* <0.0005) but not to each other ($p = 0.621$). Girls' and boys' mean use of Observing was greater than that of their teachers. There was a just significant main effect for 'Partnering' as a variable, $F(1, 26) = 4.41$, $p = 0.046$, with a large effect size, $\omega = 0.50$ (p = 31.50 and np = 40.30) when participant type was ignored. Examination of the means suggested that Observing was more apparent when partnering was not part of the task structure. There was a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 1.53$, $p= 0.235$, with a small effect size, $\omega = 0.22$.

Pupils showed significantly more Observing than their teachers did in both the TOG and TIG task groups. In both settings, girls and boys, when compared to each other, showed no such difference. In the TIG setting, mean levels of Observing were greater when partnering was not part of the task. It had no effect in the TOG setting. In both settings there was no evidence of an interaction effect between participant-type, use of partnering and levels of Observing.

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[16] The harmonic mean sample size was used in this test (given the unequal sample sizes) and had the value of 10.286. This was the case for all such tests in the TIG setting.

The third category of task-activity to be examined, using Two-way, between-groups, Independent ANOVA tests, was that for **Speaking**. Levene's H-o-V test showed homogeneity-of-variance, $F(5, 26) = 1.28$, $p = 0.302$. There was a very significant main effect of participant type on extent of Speaking, $F(2, 26) = 111.52$, $p < 0.0005$, with a large effect size, $\omega = 96$, (i.e. different types of participant were showing Speaking to very different extents if 'Partnering' was taken into account). When means were examined it was apparent that girls' and boys' means were similar to each other but much lower than those of their teachers (g = 14.75, b = 19.38 and t = 67.92). Hochberg's GT2 post hoc test showed that girls' and boys' mean levels were both very similar to each other ($p = 0.618$) but very significantly lower than that of the teachers (both $ps < 0.0005$).Teachers in the TIG groups were showing Speaking to a much greater extent than either type of pupil. There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 0.27$, $p = 0.606$, $\omega = 0$ (p = 39.17 and np = 33.85) when participant type was ignored. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.17$, $p= 0.845$, $\omega = 0$.

Comparing the TOG and TIG results for the category of 'Speaking' as a task-activity, teachers showed more Speaking than their pupils did in the TIG setting while in the TOG setting no differences between the participant types were apparent. 'Partnering' as a variable did not appear to affect the extent of Speaking as a task-activity in either setting. Equally, there was no evidence of an interaction effect between participant-type, use of partnering and levels of Speaking in either setting.

Further Two-way, between-groups, Independent ANOVA tests were used to examine the extent to which **Using-materials,** the fourth category of task-activity, was apparent in the TIG setting tasks. These involved the same independent variables reported above. Levene's H-o-V test showed a just significant lack of homogeneity-of-variance, $F(5, 26) = 2.65$, $p = 0.046$. There was a just significant main effect of participant type on extent of Using-materials, $F(2, 26) = 5.07$, $p = 0.014$, with a large effect size, $\omega = 0.53$, (i.e.

different types of participant were showing Using-materials, to slightly different extents if 'Partnering' was not taken into account). When means were examined it was apparent that girls' and boys' means were slightly similar to each other and greater than that of their teachers (g = 8.00, b = 11.38 and t = 3.08). Games-Howell post hoc tests (as there was a lack of homogeneity) were carried out first. Girls' and boys' means were just significantly different to those of their teacher (g: $p = 0.027$, b: $p = 0.030$, and similar to each other ($p = 0.493$). When Hochberg's GT2 post hoc test was used (as sample sizes were different) the harmonic mean sample size of 10.286 was used in the calculations), the boys' mean was significantly larger than that of the teachers' ($p = 0.004$), but that of the girls' mean showed no difference ($p = 0.071$). No difference was also apparent between girls' and boys' means ($p = 0.388$). Taken together the results suggested that the boys' mean use of Using-materials may have been greater than their teachers, with girls' mean use being less clearly greater. There was a non-significant main effect for 'Partnering' as a variable, $F(1, 26) = 2.98$, $p = 0.096$, with a medium effect size, $\omega = 0.40$, ($p = 4.58$ and np = 8.45) when participant type was ignored. There was also a non-significant interaction effect between type of participant and the use of partnering in the task $F(2, 26) = 0.07$, $p = 0.935$, $\omega = 0$.

Pupils in the TIG setting[17] seemed to be showing a just significantly greater extent of Using-materials (although not clearly so in the case of the girls) while in the TOG groups pupils clearly showed greater use of Using-materials compared to their teachers. Girls and boys, when compared to each other, showed no such difference in both settings. The variable 'Partnering' showed no apparent effect in relation to Using-materials in either setting. In addition, there were no interaction effects, between participant-type, use of partnering and levels of Using-materials, in either setting.

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[17] Pool data: as main results except for Using-materials, where boys also showed a greater use than girls ($p = 0.001$) but this result was compromised by a lack of homogeneity of variance ($F(2,71) = 8.407$, $p = 0.001$). KW data: as main results, with two exceptions. First, girls' results showed more No-Activity than did teachers, $p < 0.02$, $r = -0.33$, and second, boys' results showed a greater incidence, than girls, of Using-materials, $p < 0.003$, $r = -0.39$. See Appendix 8, Tables 8.09 and 8.16.

In summary, the two-way ANOVA results for the TOG and TIG settings, across all the categories of task-activity, revealed that girls and boys were showing similar mean M%C count levels for each task-activity category. Where differences were apparent they were again between pupils and teachers. TOG teachers' mean extent of No-Activity was greater than that of their pupils. This was in contrast to the TIG setting where no differences were apparent between the different types of participant. In both TOG and TIG settings, pupils showed more mean use of Observing than did their teachers. Speaking in the TOG setting was at similar levels for all three types of participant. However, in the TIG setting, teachers showed Speaking to a much greater extent than did pupils. Using-materials was shown to a greater extent by pupils compared to teachers in the TOG setting and similarly, but less significantly, in the TIG setting (although the TIG results are not clear). The use of partnering in tasks had no apparent effect on No-Activity levels in the TOG setting. In contrast, it did seem to be associated with greater No-Activity in the TIG setting where partnering was part of the task. Partnering had no apparent effect on the extent of Observing in the TOG setting. However, in the TIG setting there was a greater use of Observing when partnering did *not* feature in the task structure. Speaking appeared to be unaffected in both settings by the use, or not, of partnering in the task. The same was the case for Using-materials. There were no interaction effects, between participant-type, use of partnering and levels of Using-materials, in either setting, in any of the comparisons for the categories of task-activity.

5.7.3 TIG task-activity-profiles

Profiles for task-activity were identified as in Section 5.4.5, earlier, and are shown in Table 5.17. Inspection of this table made it apparent that virtually all the pupil profiles, both girls and boys, were Observing-led, while those of the teachers were Speaking-led. This was in contrast to the TOG setting (Table

Table 5-17 Task-activity-profiles (representing relative prevalence of category counts) for girls, boys and teachers, in the TIG groups (N = 12).

Group		Task-activity-profiles [a]		
		Girls[b]	Boys[b]	Teacher[c]
TIG1a				
	1	**O > N = S = U**	[d]	**S > N = O = U**
	2	**O > N > S = U**	[d]	**S > N > O = U**
	3	**O > N = S > U**	[d]	**S > N = O > U**
	4	**N = O > S > U**	[d]	**S > N = O > U**
TIG1b				
	1	**O > N = S = U**	**O > S = U > N**	**S > N = O > U**
	2	-	-	-
	3	-	-	-
	4	**O > N > S = U**	**O > N = S > U**	**S > O > N = U**
TIG2a				
	1	**O > N = S = U**	**O > N = U > S**	**N = S > O > U**
	2	**N = O = S = U**	**N = O > S = U**	**S > N > O > U**
	3	**O > N = S > U**	**O > S > N = U**	**S > N = O > U**
	4	**O > N = S = U**	**O > N = S = U**	**S > N = O = U**
TIG2b				
	1	**O > N > S = U**	**O > N = S > U**	**S > N = O > U**
	2	-	-	-
	3	**O > N = S > U**	**O > N = S = U**	**S > N = O = U**
	4	-	-	-

Note: [a] = The linear sequence of letters in each profile starts with the most prevalent category and ends with the least prevalent category. The symbols in-between the letters either show that the preceding category was more prevalent than the one following ('>') or that they were of equivalent prevalence ('='). Where two or more values were at, or within, 10% of each other they were taken to be equivalent. The letters coding for the task-activity categories were: N = No activity; O = Observing; S = Speaking; U = Using-materials. A category letter in bold print indicated an 'active' task-activity category. [b] = units for each category letter were mean percentage counts (M%C). [c] = units for each category letter were percentage counts (%C). [d] = No boys in the group. '-' = No observation took place.

5.08) where pupils had shown a mixture of No-Activity and Observing-led profiles and teacher profiles were all, No-Activity-led.

Between girls and boys in the eight tasks, where both were present, 25% (2/8) had the same activity profiles (31% in the TOG setting). In the four tasks where boys were absent, girls had different profiles to those of the teachers. This difference between girls and teachers was also apparent in all of the mixed-pupil groups where boys also had no profiles in common with the Teachers (this was not the case in the TOG setting; both girls and boys had had 15%(2 / 13) the same as their teachers. Within particular participant types there was a high degree of homogeneity in profiles, which was even more apparent when only *active* task-activity-profiles were considered (the bold parts of each sequence in Table 5.17).

5.7.4 TIG active-task-activity-profiles

When both girls and boys were present in a group, their active-task-activity-profiles, when classified as *same*, *related* or *different*, gave the *same* profile of task-activity in 38% (3 / 8) of task groups. The balance were all *related* profiles (63% (5 / 8)).There were no *different* profiles. In contrast, in the TOG setting, 54% (7 / 13) had been the *same*, 15% (2 / 13), *related* and 31% (4 / 13), *different*. The difference in setting, from TOG to TIG, marked a shift from same to related profiles, suggesting that the type of task and what was involved in it was having an effect, allowing for the arbitrary basis of the underlying profiles. Overall the extent of *same* and *related* profiles was greater in the TIG setting (100%) than in the TOG setting 69%.

This was further emphasised when pupil-type and teacher comparisons were made. In both cases, there were **no** *same* or *related* profiles: they were 100% *different*. For the girls-only-groups, girls and teachers comparisons were also 100% *different.* This marked a shift towards greater difference when

compared to the equivalent results in the TOG setting: girls and boys, both, *same* 15%, *related* 31% (girls and teacher) and 46% (boys and teacher), and different, 54% (girls and teacher) and 39% (boys and teacher). These results are discussed further in chapter 6.

5.7.5 TIG active-task-activity-profiles: types, and range

Looking at the frequency of specific types of active-task-activity-profiles (Table 5.18) revealed that only *four* such profiles were needed to describe *all* the task-activity of the girls and boys (there had been seven in the TOG setting), but that *two different* profiles types could describe the activity of the teachers (there had been three such profiles in the TOG setting).

Table 5.18. Percentage incidence of particular active-task-activity-profile types among girls, boys and teachers in the TIG setting.

	Percentage of observations [a]								
	Girls			Boys			Teacher		
Task-Activity-profiles	T1 (6)	T2 (6)	**All (12)**	T1 (2)	T2 (6)	**All (8)**	T1 (6)	T2 (6)	**All (12)**
O = S = U		17	**8**						
O > S > U	33	33	**33**	50	33	**38**			
O > S = U	67	50	**58**	50	50	**67**			
O > U > S					17	**13**			
S > O > U							67	67	**67**
S > O = U							33	33	**33**

Note: [a] = Percentage calculations: For each teacher group the percentage number of total observations in which a particular active-task-activity-profile was found is given. Column percentage totals subject to rounding-up error. T1: patterns from T1's groups (a and b), T2: patterns from T2's groups (a and b). Task-activity categories: O = Observing; S = Speaking; U = Using-materials.

There was no overlap in task-activity-profiles between teachers and pupil-types (there had been in the TOG setting). The majority of profiles between girls and boys, in both classrooms and across all pupil groups, were that of Observing, Speaking and equivalent use of Using-materials (**O > S = M**). Teachers, on the other hand, predominantly employed just one activity-profile; Speaking, Observing and Using-materials (**S > O > U**). However, it should be borne in mind that these results are possibly compromised by the nature of the difference criterion used in generating the profiles being compared. The implications of these results will be discussed further in chapter 6.

5.7.6 Comparing M%C and %C: TOG vs. TIG

As TIG setting results were reported they were compared and contrasted with those from the equivalent TOG setting. Differences between the M%C in both settings (for girls and boys) and %C (for teachers) were referred to, but their statistical significance was not established. This section reports the results of a series of *t*-tests (two mean averages were being compared across the two settings for a particular type of participant in each category of the variables). The results for these comparisons are reported in Table 5.19 below.

Examination of Table 5.19 revealed that for the 'passive' categories across the variables – Presence, No-targeting and No-activity – both girls and boys showed no statistical difference in their mean counts in the two settings. Teachers, however, showed a very significant difference, with greater mean percentage counts, in the TOG setting for Presence, No-targeting and No-activity.

For the remaining categories in each of the variables a different pattern was apparent. First, for Looking-on, girls, boys and teachers all showed statistically very much greater mean percentage counts in the TIG setting,

Table 5.19 *t*-test comparisons across categories between TOG and TIG settings (significant difference and direction of mean difference).

Category	TOG/TIG comparisons (*p* values)[a] Girls	Boys	Teacher
		Gestures	
Presence	ns	ns	<0.0005 TOG (79.38) > TIG(17.08) 0.94
Looking-on	0.004 TIG (49.75) > TOG (31.62) 0.61	0.029 TIG (44.50) > TOG (32.31) 0.48	<0.0005 TIG (66.58) > TOG (8.92) 0.94
Indicative	<0.0005 TIG (16.67) > TOG (6.00) 0.69	<0.0005 TIG (21.13) > TOG (8.00) 0.70	0.038 TIG (7.00) > TOG (3.15) 0.42
Intermediary	<0.0005 TOG (31.13) > TIG (10.92) 0.79	0.001 TOG (30.92) > TIG (15.88) 0.66	ns
		Gesture-targets	
No-targeting	ns	ns	<0.0005 TOG (79.38) > TIG (17.08) 0.94
People	ns	ns	<0.0005 TIG (59.25) > TOG (14.08) 0.91
Materials	ns	ns	0.022 TIG (4.67) > TOG (1.92) 0.46
People-and-materials	ns	ns	<0.0005 TIG (19.58) > TOG (4.77) 0.74
		Task-activity	
No-activity	ns	ns	<0.0005 TOG (80.00) > TIG (17.33) 0.95
Observing	<0.0005 TIG (53.83) > TOG (26.62) 0.80	0.016 TIG (49.50) > TOG (31.23) 0.52	0.01 TIG (11.83) > TOG (5.54) 0.50
Speaking	ns	0.037 TIG (19.38) > TOG (12.69) 0.46	<0.0005 TIG (67.92) > TOG (12.08) 0.93
Using-materials	<0.0005 TOG (31.38) > TIG (8.00) 0.89	0.001 TOG (27.23) > TIG (11.38) 0.69	ns

Note: [a] = Statistically significant *p* values are given, followed by the balance of means, largest value first, and then the effect size, *r,* calculated according to Rosenthal, 1992 p19 and Field and Hole, 2003 p166). ns = not statistically significant.

although the difference was less marked for the boys. A similar emphasis was apparent in the results for Indicative gestures: mean percentage counts were higher in the TIG setting than in the TOG setting, although this time, the difference for teachers was less marked. The reverse of this pattern was apparent for Intermediary gestures as these were at much higher mean levels for girls and boys in the TOG setting. No differences were found between the teachers in the two settings. Where significant differences were apparent in the two settings the effect sizes were all medium-large to large.

Turning to the comparisons for Targeting in the two settings girls and boys showed no significant differences in the mean percentage counts for any of the categories. This was not the case for the teachers. Teachers in the TOG setting showed higher mean percentage levels of No-targeting than did their equivalents in the TIG setting. The difference also showed a large effect size. TIG teachers on the other hand, showed higher mean percentage counts for Targeting-to-People, to-Materials and to-People-and-materials than did their TOG counterparts. This difference was smallest for Targeting-to-Materials, although in all three instances, effect sizes were medium-large to large.

Finally, in terms of comparisons for Task-activity across the two settings, For Observing, girls, boys and teachers showed significantly higher mean percentage counts in the TIG setting with the boys and teachers showing this difference to a lesser extent. For Speaking, girls showed no difference in their levels across the two settings, but boys showed a just significant difference in favour of more Speaking in the TIG setting. Teachers in the TIG setting showed substantially more Speaking in this setting than did the TOG teachers. In terms of the mean percentage counts for Using-materials, girls and boys showed greater counts in the TOG setting (the boys less markedly so), teachers' results showed no difference between the two settings. These findings are discussed further in chapter 6.

5.8 Correlations between variables

5.8.1 Presence, No-Targeting and No-Activity

By definition, the category of Presence in the gesture variable meant no gestures were being produced (see chapter 4). They would thus not be available for targeting and so would be counted as 'No-targeting'. As a participant scored in these categories would also not be engaged in an activity they would be counted as showing 'No-activity'. Correlations between these three categories would thus be, by definition, complete. However, correlations between the other categories might reflect underlying associations. As a result a correlation analysis was applied to pair-wise combinations of the active categories of the three variables, gesture, gesture-targets and task-activity. The results are presented in the following sections (the detailed data for the correlations and related scatterplots (sp), where results appeared significant, are given in Appendix 7; interpretation of these scatterplots also drew on the raw data in Appendix 1).

5.8.2 Correlations: active-gesture X active-gesture-targeting

The results for comparisons between the active-gesture and active-targeting categories, in both the TOG and TIG settings, are shown in Table 5.20, and were derived from correlation data given in Appendix 7, Tables 7.01- 7.03. The associated scatterplots, which were used to inform judgements of significance in the following account, are also given in Appendix 7. Each scatterplot relating to a significant statistical result was referenced in the text using the abbreviation 'sp', followed by the Figure number from Appendix 7. This approach was used in sections 5.8.2, 5.8.3 and 5.8.4. Any issues relating to particular scatterplots were referred to in the text.

Bonferroni corrections (Field and Hole, 2003 p 173) were applied to each set of comparisons as multiple tests had been carried out using the same data. The significance of the results was therefore judged on the basis of a corrected indication of significance[18]. **Where results are reported in the text, the original *p* value is reported followed by a star rating to indicate the *corrected* significance interpretation**. These ratings were: $p < 0.02$, '*' and $p < 0.003$, '**' (the same ratings were shown on Tables 5.21 and 5.22 when significant correlations were reported).

From Table 5.20, teachers in both the TOG and the TIG settings showed positive, significant correlations between Looking-on (involving gestures such as gaze, leaning and turning) and Targeting-to-People (TOG teachers, N = 13, $r = 0.786$, $p = 0.001$**, sp 7.01, and TIG teachers, N = 12, $r = 0.733$, $p = 0.007$* , sp 7.02, the significance level being arguably higher in the TOG setting. Only in the TOG setting did girls show a similar significant correlation for this combination (N = 13, $r = 0.689$, $p = 0.009$ *, sp 7.03). For the combination of Looking-on and Targeting-to-Materials, there were no correlations in the TOG setting for girls, boys or teachers. However, in the TIG setting, only the girls showed a significant, positive, correlation (N = 12, $r = 0.728$, $p = 0.007$*, sp 7.04). For the combination of Looking-on and Targeting-to-People-and-materials no correlations, for any participant type, in either setting, were apparent.

The next combinations to be examined were those between Indicative gestures (involving joint-gaze, touching, pointing, hand-raising and facial and head moving gestures, such as nodding) and the targeting categories. No significant correlations were apparent for girls, boys or teachers in either setting. This was the case for all three targeting categories.

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[18] Each variable category was used three times in a particular set of test comparisons. Taking 'α' at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05 and rated with one star '*' on the correlation tables. For a 'α' *of* 0.01, *p* values below 0.01 / 3 = 0.003 were rated at two stars '**'.

Table 5.20 Pearson's *r* correlations between active categories of Gesture and Gesture-targeting (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
	Girls	Boys	Teachers	Girls	Boys	Teachers
Test	N = 13	N = 13	N = 13	N = 12	N = 8	N = 12
L x P	**0.689***	0.565	**0.786****	0.349	0.337	**0.733***
L x M	0.456	0.598	0.200	**0.728***	0.726	-0.053
L x Pm	0.202	-0.300	0.243	-0.075	0.143	-0.008
I x P	-0.359	-0.113	0.459	0.392	0.657	0.263
I x M	-0.073	-0.159	-0.077	0.058	0.010	-0.088
I x Pm	0.237	0.611	0.063	0.448	0.661	-0.088
In x P	0.020	-0.118	0.477	-0.156	-0.268	**-0.884****
In x M	-0.099	0.018	0.320	-0.344	0.744	0.478
In x Pm	0.074	0.358	**0.942****	0.244	-0.359	0.602

Note: Gesture categories: L = Looking-on, I = Indicative, In = Intermediary. Targeting categories: P = People, M = Materials, Pm = People and materials. Significance: after Bonferroni correction; * < 0.02, ** < 0.003.

Comparisons between Intermediary gestures (which included handling, holding, handing-on and exchange actions) and Targeting-to-People, identified no significant correlations for TOG girls, boys and teachers in the results. In the TIG setting, for the same combination, teachers alone showed a correlation, which was negative and large, (N = 12, r = -0.884, p <0.0005**, sp 7.05). No correlations were apparent in the TOG and TIG settings for Intermediary gestures and Targeting-to-Materials. Intermediary gestures Targeted-to-People-and-materials produced no correlations for girls or boys, in both settings. However, a very significant large correlation for teachers, (N

= 13, $r = 0.942$, $p < 0.0005$**, sp 7.06) was noted in the TOG setting. In contrast, no such correlation was apparent for teachers in the TIG setting.

Overall, such differences as were apparent were not consistently present across settings for particular types of participant, except for teachers in associations between Looking-on and Targeting-to-People. These results, like those that follow, are discussed further in chapter 6.

5.8.3 Correlations: active-gesture X active-task-activity

Table 5.21 reports the results of a series of correlation comparisons between active-gesture categories and particular categories of active-task-activity (see Appendix 7, Tables 7.04-7.06) for both the TOG and TIG settings. Links to related scatterplots are shown by 'sp', followed by the relevant figure number in Appendix 7.

Examining Looking-on gestures and Observing as a task-activity (involving looking at work materials, at others or at others as they worked), in the TOG setting, both girls and boys showed positive, significant, correlations (girls, N = 13, $r = 0.762$, $p = 0.002$**, sp 7.07 (the scatterplot was diffuse around the apparent trend) and boys, N = 13, $r = 0.732$, $p = 0.004$*, sp 7.08 (the scatterplot showed bunching at the bottom left part of the plot). The girls and boys in the TIG setting (girls, N = 12, $r = 0.813$, $p = 001$**, sp 7.09, and boys, N = 8, $r = 0.930$, $p = 0.001$**, sp 7.10) also showed positive and significant correlations, with clearer trends in the related scatterplots. In both settings, the teachers showed no such correlations. When Looking-on and Speaking were examined as a combination, teachers in both settings showed significant, positive, correlations (TOG teachers; N = 13, $r = 0.721$, $p = 0.005$*, sp 7.11, and TIG teachers; N = 12, $r = 0.896$, $p < 0.0005$**, sp 7.12), with the TIG teachers showing the greater degree of significance. Girls and boys in both settings, for the same combination, showed no significant correlations.

Table 5.21 Pearson's *r* correlations between active categories of Gesture and Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
L x O	**0.762****	**0.732***	0.340	**0.813****	**0.930****	-0.331
L x S	0.159	-0.551	**0.721***	-0.575	-0.035	**0.896****
L x U	**0.693***	0.238	-0.036	-0.304	-0.286	**-0.715***
I x O	-0.534	-0.315	**0.650***	0.475	0.492	0.492
I x S	0.097	0.398	0.193	0.195	-0.423	-0.068
I x U	0.014	0.621	-0.159	-0.332	-0.099	0.188
In x O	-0.062	-0.150	0.091	-0.541	-0.767	-0.151
In x S	0.307	0.138	**0.731***	0.176	0.232	-0.450
In x U	-0.525	0.313	0.567	**0.823****	0.556	**0.827****

***Note*:** Gesture categories: L = Looking-on, I = Indicative, In = Intermediary. Task activity: O = Observing, S = Speaking, U = Using-materials. Significance: after Bonferroni correction; * < 0.02, ** < 0.003.

Looking-on and Using-materials produced a different pattern of correlations: girls in the TOG setting showed a significant, positive correlation (N = 13, *r* = 0.693, *p* = 0.009*, sp 7.13 (some of the points were some way away from the trend) but not the boys or teachers. In the TIG setting, in contrast, only the teachers showed a correlation for this combination, which was both negative, and significant (N = 12, *r* = -0.715, *p* <0.001**, sp 7.14).

The only correlation between Indicative gestures and Observing, in either setting, was for the TOG teachers (N = 13, r = 0.650, p = 0.016*, sp 7.15) which was just significant and may not have been a reliable correlation given the scattered appearance of the associated scatterplot. Indicative gestures and Speaking showed no correlations in the TOG or TIG settings, for any of the participant types, as was the case for Indicative gestures and Using-materials.

When Intermediary gestures were compared to task-activities for associational purposes a number of correlations were apparent. For Intermediary gestures and Observing no correlations in either setting were recorded. However, a positive correlation between Intermediary gestures and Speaking was noted for teachers in the TOG setting (N = 13, r = 0.731, p = 0.004*, sp 7.16 (although this had an indistinct trend line on its associated scatterplot.), but no others were apparent in either setting. While there were no correlations between Intermediary gestures and Using-materials in the TOG setting there were two in the TIG setting. The first was for girls, N = 12, r = 0.823, p = 0.001**, sp 7.17, and the second for teachers, N = 12, r = 0.827, p = 0.001**, sp 7.18. Both were large and positive.

Overall both settings produced similar numbers of correlations. They were mostly apparent, in both settings, in associations between Looking-on gestures and different forms of Task-activity. They are discussed further in chapter 6.

5.8.4 Correlations: active-gesture-targets X active-task-activity

The last sets of correlations to be investigated were those between the categories of the gesture-target variable and those of the task-activity variable for both the TOG and TIG settings. The results are shown in Table 5.22, itself based on the correlation data tables in Appendix 7 (Tables 7.07-7.09). As in

Table 5.22. Pearson's *r* correlations between active categories of Gesture-targets and Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
	Girls	Boys	Teachers	Girls	Boys	Teachers
Test	N = 13	N = 13	N = 13	N = 12	N = 8	N = 12
P x O	**0.789****	**0.883****	0.576	0.376	0.193	-0.014
P x S	0.114	-0.510	**0.780****	-0.139	0.003	0.623
P x U	0.184	-0.480	0.567	0.226	0.400	**-0.814****
M x O	0.314	**0.681***	0.002	**0.796****	**0.830***	-0.019
M x S	0.283	-0.549	0.198	**-0.761***	-0.476	0.067
M x U	**0.677***	-0.003	**0.749***	-0.160	-0.454	0.349
Pm x O	0.191	-0.436	-0.010	0.176	0.036	-0.373
Pm x S	0.284	0.460	**0.783****	0.307	0.715	0.216
Pm x U	0.094	**0.795****	0.538	-0.038	0.279	0.596

Note: Gesture targeting categories: P = People, M = Materials, Pm = People-and-materials. Task activity: O = Observing, S = Speaking, U = Using-materials. Significance: after Bonferroni correction; * < 0.02, ** < 0.003.

preceding sections, the associated scatterplots are referenced using 'sp' accompanied by the related figure number from Appendix 7.

Looking first at the comparisons between Targeting-at-People and the various forms of task-activity, more correlations were recorded in the TOG setting than in the TIG setting. Targeting-to-People compared with Observing resulted in significant, and positive, correlations, for girls, N = 13, $r = 0.789$, $p = 0.001$ **, sp 7.19 (the scatterplot showed a broad distribution but with a

clear trend), and boys, N = 13, r = 0.883, p <0.0005 **, sp 7.20, but not teachers. No correlations were apparent for the same comparison in the TIG setting. For Targeting-to-People when Speaking, teachers, N = 13, r = 0.780, p = 0.002 **, sp 7.21 (again, a slightly broad scatter of plots but with a clear trend), showed a positive, significant result, but no others were apparent in both the TOG and TIG settings. The only correlation between Targeting-to-People and Using-materials was found to be for teachers, in the TIG setting (N = 12, r = -0.814, p = 0.001**, sp 7.22), and was negative and large.

When associations between Targeting-to-Materials and the various task-activity categories were examined further associations were apparent. A correlation was noted between Targeting-to-Materials and Observing for just the boys in the TOG setting (N = 13, r = 0.681, p = 0.010*, sp 7.23). This was positive and just significant (the scatterplot showed a clear trend with some bunching in the lower left hand part of the plot). However, in the TIG setting, both girls, N = 12, r = 0.796, p <0.002 **, sp 7.24, and boys, N = 8, r = 0.830, p = 0.011*, sp 7.25, showed, for the girls, a significant and positive correlation, while for the boys, the correlation was also positive but less significant (fewer data points contributed to this comparison, although a clear trend was apparent). The teachers in both settings showed no correlations for this combination. Targeting-to-Materials compared to Speaking produced only one association in both settings and that was for girls in the TIG setting (N = 12, r = -0.761, p = 0.004*, sp 7.26) which was negative and quite large (but with some scatter around the trend). Two correlations were apparent in the TOG setting (but none in the TIG setting) for Targeting-to-Materials and Using-Materials. The first of these was for girls, (N = 13, r = 0.677, p = 0.011*, sp 7.27), which was just significant and positive (with a discernable trend in the scatterplot). The second was for teachers in the same setting, (N = 13, r = 0.749, p <0.003*, sp 7.28), which was also positive and slightly more significant. The scatterplot showed that as a number of the values being compared were both zero, multiple points were at (0,0). The plotted points contributing to the trend were thus fewer in number than in the other comparisons, querying the validity of the correlation.

Finally, comparisons between Targeting-to-People-and-Materials and particular types of task-activity produced further correlations, although these were only in the TOG setting. None were apparent for Targeting-to-People-and-Materials and Observing in either setting. Only teachers in the TOG setting showed a correlation for Targeting-to-People-and-Materials and Speaking (N = 13, $r = 0.783$, $p < 0.002$**, sp 7.29). This was positive and significant. For the comparisons between Targeting-to-People-and-Materials and Using-materials, the only correlation was in the TOG setting (none in the TIG setting), where boys showed a significant and positive correlation (N =13, $r = 0.795$, $p < 0.001$**, sp 7.30).

Overall the majority of the correlations between gesture targets and task-activity were in the TOG setting rather than the TIG setting. There were few equivalent correlations in the two settings. This was apparent across the targeting categories. Possible explanations for these results are discussed in chapter 6.

5.9 Targeting Case studies

5.9.1 The case studies

The data reported so far has been analysed at the group level. However in support of some of the assumptions made about the nature of gesture and gestural targeting - that is, that targeting was intentional and directed at particular targets in particular interactional contexts - a series of eight case studies of targeting-activity within specific groups were undertaken.

Four were drawn from the TOG setting (4 / 13, 31% of TOG groups) and four from the TIG setting (4 / 12, 33% of TIG groups). Counts of how many gestures were targeted at particular participants in the group were compared

to a person's total targeting in the group during the whole task observation and converted to a percentage. The relative positions of the participants were recorded in case proximity between participants was an issue as suggested in the literature review in chapter 3. Pupils were given assumed names for discussion purposes; teachers were identified as 'Teacher'.

The four observations in each setting constituted a notional series of observations of what was, superficially, the same group. The case studies were also intended to inform the discussion of the 'distinctness' of pupil groups participating in the study. A 'bird's-eye view' of each group was provided to aid spatial identification when considering the results, including an arrowed line to indicate who sat opposite a particular participant at the time of observation.

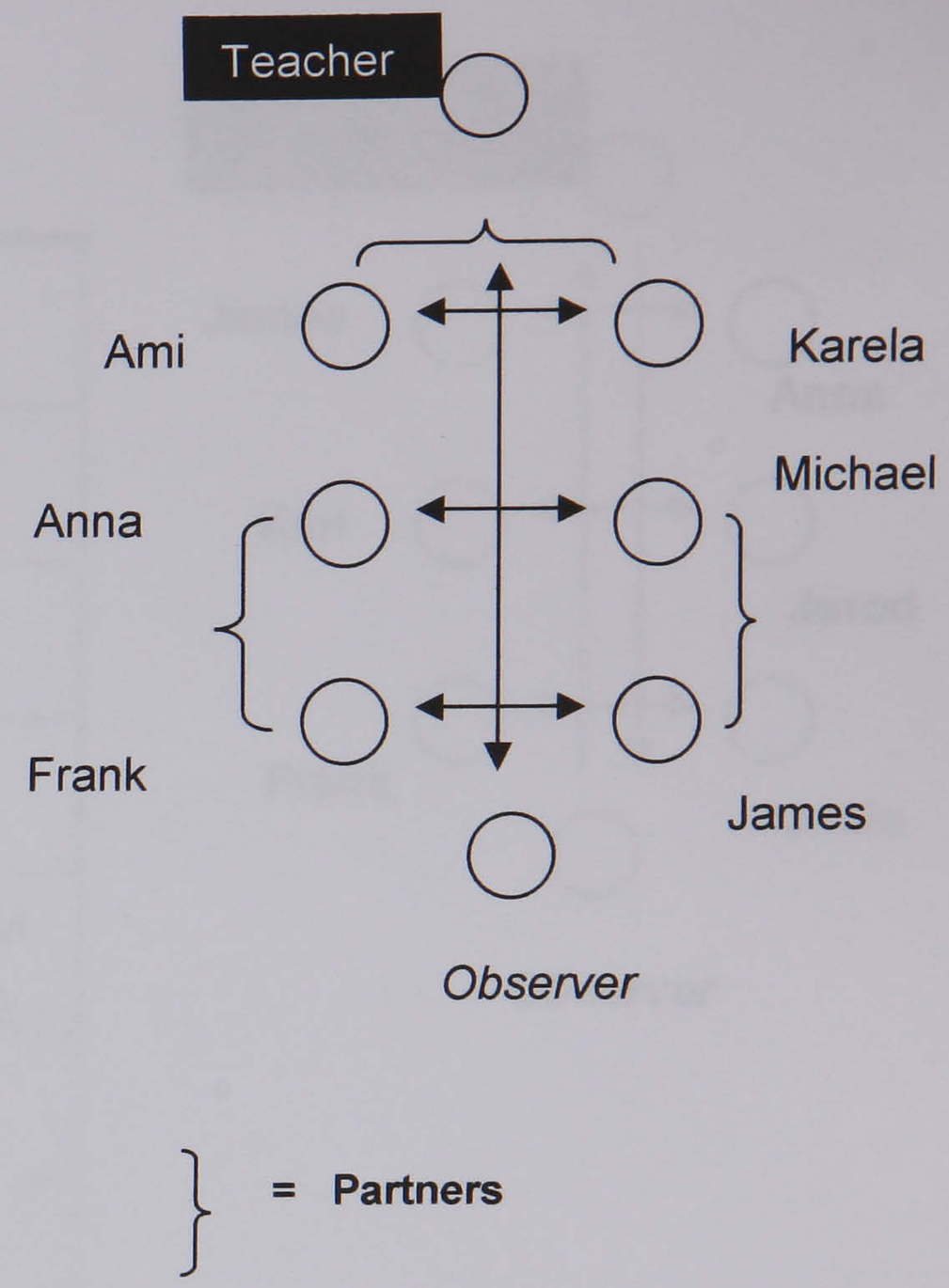
5.9.2 The TOG case studies

The four case studies and their associated spatial layouts for the TOG setting are reported in Tables 5.23 - 5.26. The left-hand column of each table gave the name of particular participants. The row to its left gave the percentage of the total targeted-gestures made by that person to each specific member of the group. The column in grey identified who, if at all, sat opposite the participant in question. The order of participants to either side of the grey column indicated the relative position of other participants to their left and right. Both teacher (black square) and Observer (white square, italic type) were shown, also in the correct position relative to each participant. Names identified each participant and linked him or her to the aerial view of the group shown near the table.

In all four case studies, particular participants were targeting other members of the groups at levels above or below the chance frequency – in many instances markedly so - supporting the view that the targeting was intended

Table 5.23 TOG targeting case study [1]: Percentage of an individual's total targeting.

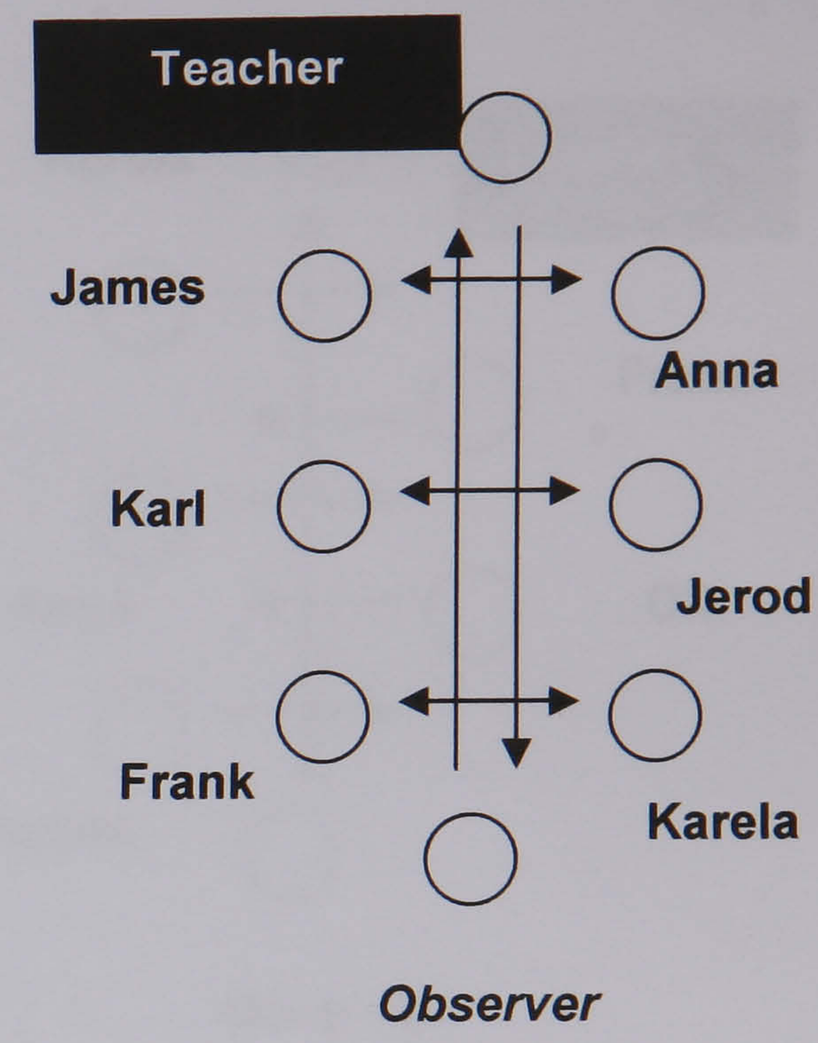
Participant [n]	<< Increasingly **leftwards** of targeting-producer.					Opposite targeting-producer.	Increasingly **rightwards** of >> targeting-producer.				
Teacher (T) [4]	-	-	James **50.0**	Michael **0**	Karela **0**	*Ob* ***25.0***	Ami **0**	Anna **0**	Frank **25.0**	-	-
Karela [45]	Anna **17.8**	Frank **13.3**	***Ob*** ***4.4***	James **22.2**	Michael **20.0**	Ami **20.0**	**T** **2.2**	-	-	-	-
Michael [22]	-	-	Frank **0**	***Ob*** ***20.0***	James **44.0**	Anna **12.0**	Karela **0**	**T** **8.0**	Ami **16.0**	-	-
James [36]	-	-	-	-	***Ob*** ***0***	Frank **11.1**	Michael **30.6**	Karela **25.0**	**T** **8.3**	Ami **13.9**	Anna **11.1**
Frank [22]	Michael **9.1**	Karela **9.1**	**T** **14.3**	Ami **9.1**	Anna **13.6**	James **13.6**	***Ob*** ***40.9***	-	-	-	-
Anna [44]	-	-	Karela **25.0**	**T** **0**	Ami **15.9**	Michael **25.0**	Frank **13.6**	***Ob*** ***0***	James **20.5**	-	-
Ami [33]	-	-	-	-	**T** **30.3**	Karela **9.1**	Anna **6.1**	Frank **30.3**	***Ob*** ***0***	James **15.2**	Michael **9.1**
Observer (Ob) [3]	-	-	Ami **0**	Anna **0**	Frank **0**	T 33	James **67**	Michael **0**	Karela **0**	-	-



Note: Based on observation number Co-1-B-2-1-18; 2). [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time was 1 / 7 (N = 8) = 14.3%.

Table 5.24 TOG targeting case study [2]: Percentage of an individual's total targeting.

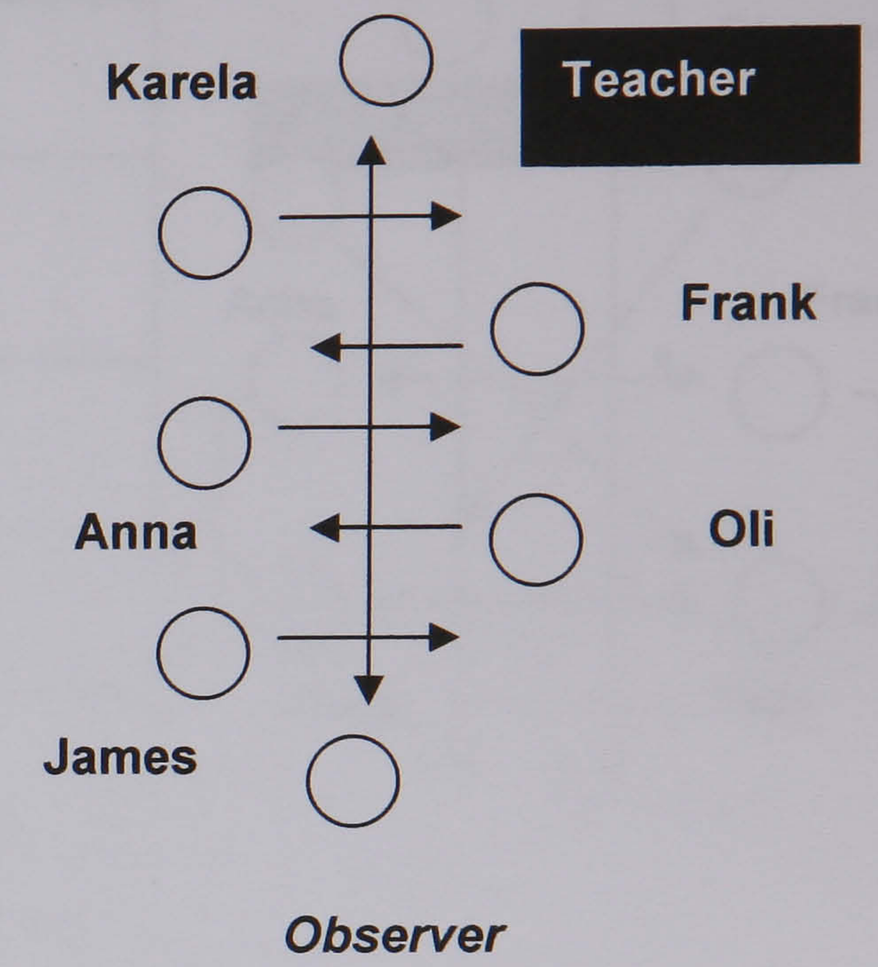
Participant [n]	<< Increasingly **leftwards** of targeting-producer.					Opposite targeting-producer.	Increasingly **rightwards** of >> targeting-producer.				
Teacher (T) [55]	-	-	Karela **16.4**	Jerod **16.4**	Anna **16.4**	-	James **18.2**	Karl **16.4**	Frank **16.4**	Ob **0**	-
Anna [15]	Karl **0**	Frank **0**	***Ob*** ***0***	Karela **53.3**	Jerod **6.7**	James **6.7**	T **33.3**	-	-	-	-
Jerod [78]	-	-	Frank **16.7**	***Ob*** ***0***	Karela **18.0**	Karl **16.7**	Anna **19.2**	T **5.1**	James **24.4**	-	-
Karela [9]	-	-	-	-	**Ob** **0**	Frank **0**	Jerod **0**	Anna **77.8**	T **22.2**	James **0**	Karl **0**
Frank [16]	Jerod **12.5**	Anna **0**	T **12.5**	James **12.5**	Karl **18.8**	Karela **0**	***Ob*** ***43.8***	-	-	-	-
Karl [39]	-	-	Anna **12.8**	T **10.2**	James **35.9**	Jerod **7.7**	Frank **15.4**	***Ob*** ***12.8***	Karela **5.1**	-	-
James [99]	-	-	-	-	T **6.1**	Anna **16.2**	Karl **26.3**	Frank **16.2**	***Ob*** ***0***	Karela **16.2**	Jerod **19.2**
Observer (Ob) [8]	-	-	Ami **0**	Karl **25.0**	Frank **75.0**	-	Karela **0**	Jerod **0**	Anna **0**	T **0**	-



Note: Based on observation number: Co-1-B-2-2-24; 3. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time was 1 / 7 (N = 8) = 14.3%.

Table 5.25 TOG targeting case study [3]: Percentage of an individual's total targeting.

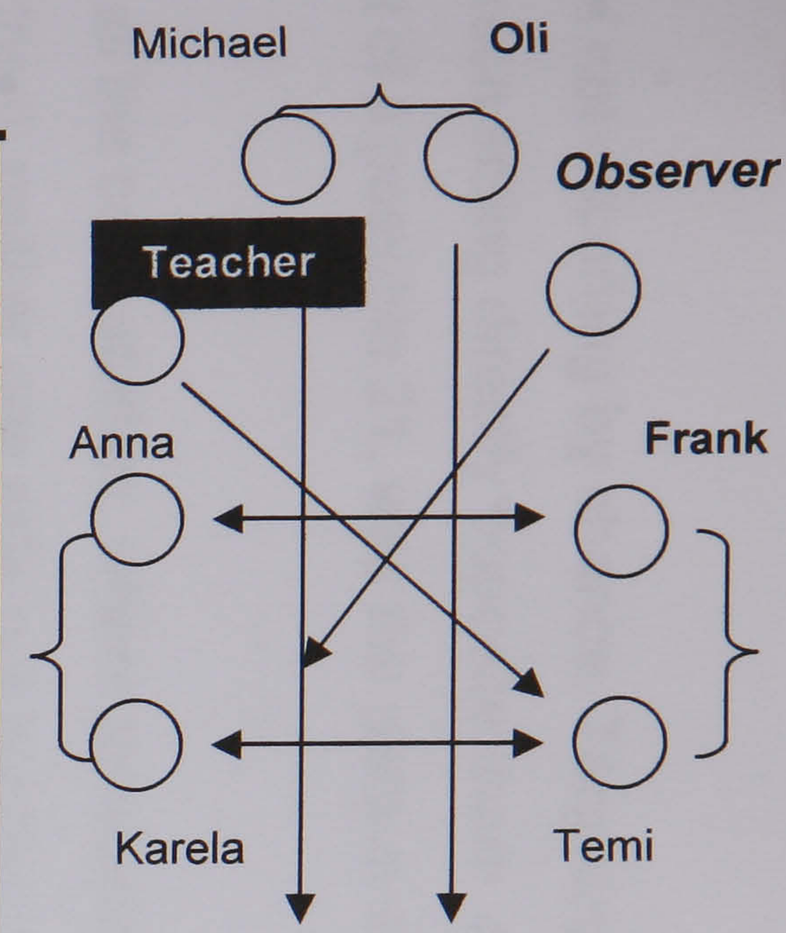
Participant [n]	<< Increasingly **leftwards** of targeting-producer.					Opposite targeting-producer.	Increasingly **rightwards** of >> targeting-producer.				
Teacher (T) [19]	-	-	-	Oli **15.8**	Frank **15.8**	***Ob*** ***0***	Karela **36.8**	Anna **15.8**	James **15.8**	-	-
Frank [24]	-	Anna **25.0**	James **12.5**	***Ob*** ***29.2***	Oli **8.3**	-	T **16.7**	Karela **8.3**	-	-	-
Oli [9]	-	-		James **55.6**	***Ob*** ***0***	-	Frank **0**	T **33.3**	Karela **0**	Anna **11.1**	-
James [25]	Oli **12.0**	Frank **28.0**	T **12.0**	Karela **16.0**	Anna **24.0**	-	***Ob*** ***8***	-	-	-	-
Anna [18]	-	-	Frank **0**	T **16.7**	Karela **61.0**	-	James **11.1**	***Ob*** ***5.6***	Oli **5.6**	-	-
Karela [29]	-	-	-	-	T **17.2**	-	Anna **55.2**	James **6.9**	***Ob*** ***0***	Oli **6.9**	Frank **13.8**
Observer (Ob) [0]	-	-	Karela **0**	Anna **0**	James **0**	T 0	Oli **0**	Frank **0**	-	-	-



Note: Based on observation Co-1-B-2-3-11;5. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 6 (N = 7) = 16.7%.

Table 5.26 TOG targeting case study [4]: Percentage of an individual's total targeting.

Participant	<< Increasingly **leftwards** of targeting-producer.						Opposite targeting-producer.	Increasingly **rightwards** of >> targeting-producer.					
Teacher (T) [79]	-	-	Frank **16.5**	***Ob*** ***0***	Oli **16.5**	Michael **17.7**	Temi **13.9**	Anna **17.7**	Karela **17.7**	-	-	-	-
Michael [12]	-		Temi **0**	Frank **33.3**	***Ob*** ***0***	Oli **41.7**	-	T **16.7**	Anna **8.3**	Karela **0**	-	-	-
Oli [9]	-	-	-	Temi **0**	Frank **0**	***Ob*** ***11.1***	-	Michael **66.7**	T **11.1**	Anna **11.1**	Karela **0**	-	-
Frank [11]	-	-	-	-	Karela **0**	Temi **27.3**	Anna **9.1**	***Ob*** ***36.4***	Oli **0**	Michael **9.1**	T **18.2**	-	-
Temi [4]	-	-	-	-	-	-	Karela **0**	Frank **75.0**	***Ob*** ***0***	Oli **0**	Michael **0**	T **25.0**	Anna **0**
Karela [9]	Frank **0**	***Ob*** ***0***	Oli **0**	Michael **11.1**	T **11.1**	Anna **66.7**	Temi **11.1**	-	-	-	-	-	-
Anna [6]	-	-	***Ob*** ***0***	Oli **0**	Michael **16.7**	T **16.7**	Frank **0**	Karela **50.0**	Temi **16.7**	-	-	-	-
Observer (Ob) [1]		-	-	Karela **0**	Temi **0**	Frank **100.0**	-	Oli **0**	Michael **0**	T **0**	Anna **0**	-	-



} = **Partners**

Note: Based on observation Co-1-B-2-4-8;6. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 7 (N = 8) = 14.3%.

and not occurring by chance. Targeting was independent of there being a person sitting directly opposite them 'catching their eye'. In only 1 instance, out of a possible 21, was the person sitting opposite targeted the most.

In all the case studies, where participants had other participants on both sides of them, neither one side nor another of a person was favoured as a field for targeting, rather it was the location of particular people who formed the focus of attention. At the same time, a person's position around the table (if they were at a corner for example) could affect the extent of turning they would have to do in order to target other group members.

Where partnering was involved, the highest level of targeting was usually to the other partner. Out of 12 possible instances of individuals involved in partnerships in the TOG case studies, 8 directed most of their attention to their partners. This suggested purposeful and intended activity.

As the teacher was only a visitor to this type of group, targeting to her and by her was more variable than that for pupil participants. For pupils, the presence of the teacher was sometimes used as an occasion to focus targeting of gesture to her. But this only occurred when help was requested or the teacher asked the pupil concerned if help was needed.

Levels of targeting to the observer were also variable. One boy in particular (Frank) attended to the observer at very high levels across the observations. The reasons behind this will be discussed further in chapter 6. They related to the personal circumstances of the boy in question, implying that targeting behaviour might not just be task related.

Specific individuals targeted the same other participants to differing extents in subsequent observations, as shown in Table 5.27, for participants who were

Table 5.27. Participant targeting in the TOG setting across tasks.

		% Targeting to person			
Participant	Case study	Karela	Anna	Frank	James
Karela	1	-	17.8	13.3	22.2
	2	-	77.8[a]	0	0
	3	-	55.2	13.8	6.9
	4	-	66.7[a]	0	abs
Anna	1	25.0	-	13.6	20.5
	2	53.3[a]	-	0	6.7
	3	61.0	-	0	11.1
	4	50.0[a]	-	0	abs
Frank	1	9.1	13.6	-	13.6
	2	0	0	-	12.5
	3	8.3	25.0	-	12.5
	4	0	9.1	-	abs
James	1	25.0	11.1	11.1	-
	2	16.2	16.2	16.2	-
	3	16.0	24.0	28.0	-
	4	abs	abs	abs	-

Note: [a] = Were partners with each other. [abs] = absent.

present in the majority of the case studies. When the same potential targets were present in successive groups they were generally targeted to differing extents in each group.

Even where group composition was similar, targeting was different, adding a further dimension of difference between notionally similar groups. This analysis did not allow for friendships between participants. This data was not available as the host Local Education Authority did not permit this question to be investigated.

5.9.3 The TIG case studies

Four case studies in the TIG setting were also examined, the last of which offered an additional opportunity to examine what happened when a participant changed their position in the group at the direction of the teacher (Table 5.31 and 5.32). The tables reporting this data (Table 5.28 - 5.32) were laid out in the same way as those for the TOG setting.

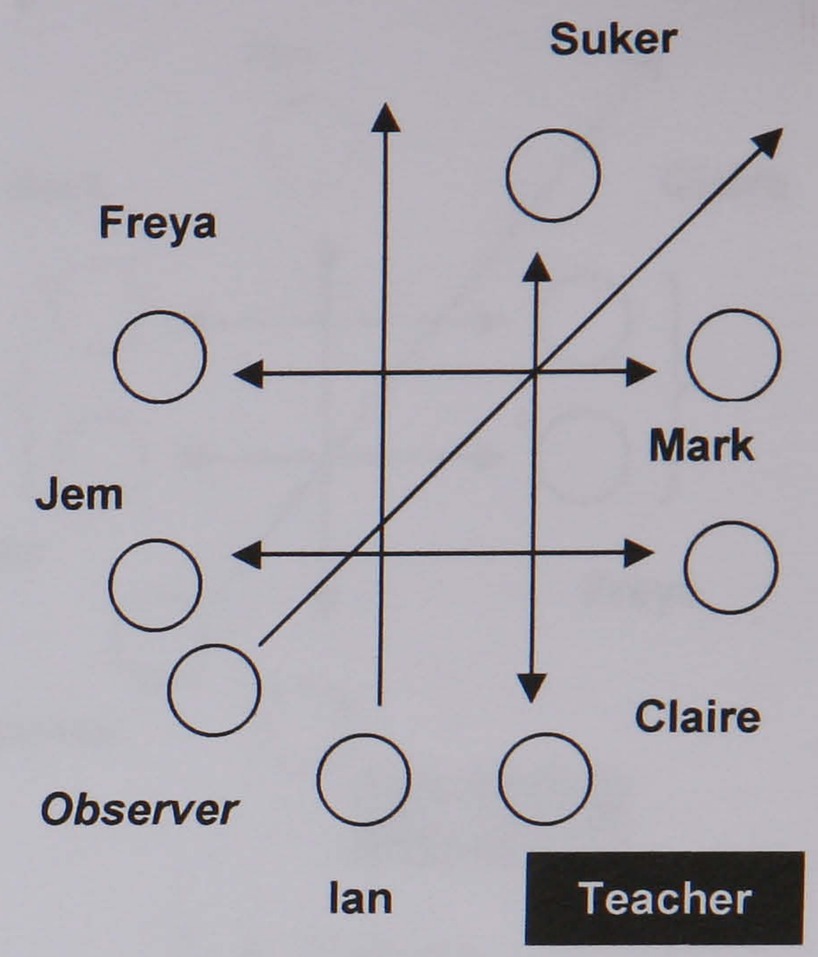
As in the TOG setting (section 5.9.2), all participants were targeting other participants above or below chance levels supporting the view that targeting, and thus the gestures being targeted, was being carried out intentionally. Targeting to the person opposite, by a particular participant as their highest frequency of targeting, only occurred in 5 out of 14 (36%) possible instances. However, four of these were targeted at teachers.

Teachers received the highest level of targeting by pupils in all possible instances across the TIG case studies – (19 /19) - the teacher in the group was the main target for all pupils in each case study. This stood in contrast to the situation in the TOG case studies, where the teacher was targeted most by pupils in only 1 out of 23 (4%) instances, and at the same level as another pupil in 2 out of 23 (9%) instances. All three of these were by the same pupil (Frank).

Where participants had other participants on either side, attention did not seem to be focused on one side rather than another. Rather it was focused on particular *individuals*. This was distorted, however, by the relative location of the teacher towards whom most attention was directed. Only one of the case studies quoted for the TIG setting involved partnering but, as in the TOG setting, partners tended to focus most of their pupil directed targeting to their

Table 5.28 TIG targeting case study [1]: Percentage of an individual's total targeting.

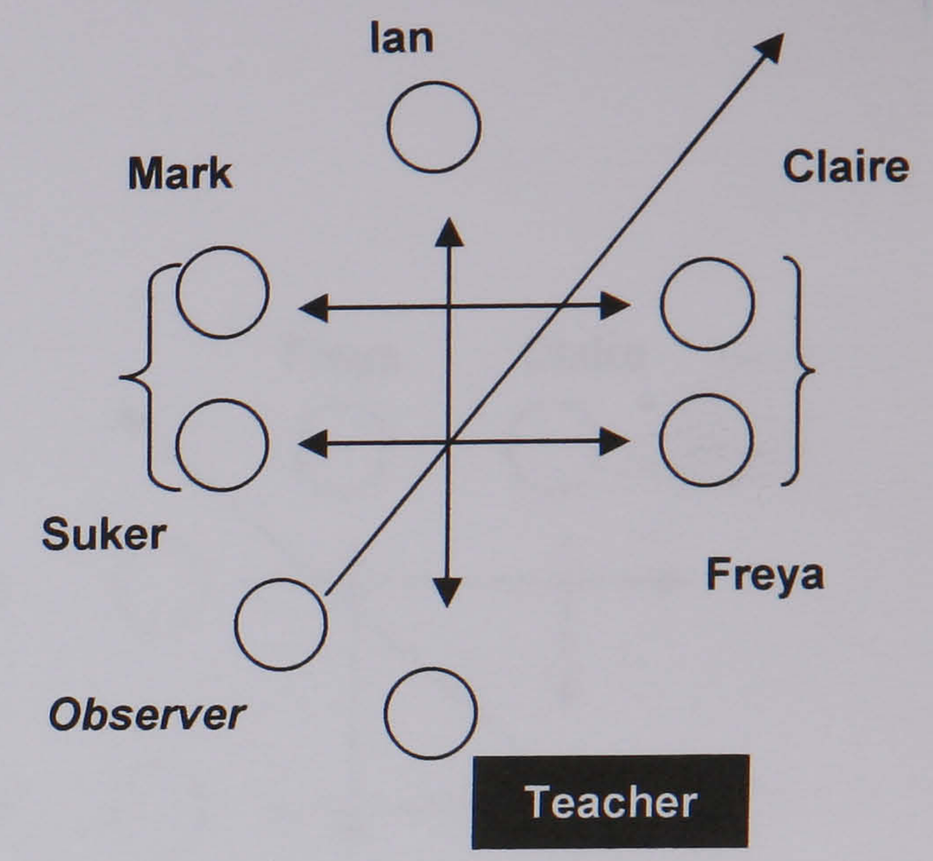
Participant [n]	<< Increasingly **leftwards** of targeting-producer.					Opposite targeting-producer.	Increasingly **rightwards** of >> targeting-producer.				
Teacher (T) [81]	-	Freya **16.1**	Jem **9.9**	***Ob*** ***0***	Ian **33.3**	Suker **11.1**	Claire **17.3**	Mark **12.4**	-	-	-
Ian [41]	-	-	Freya **7.3**	Jem **7.3**	***Ob*** ***19.5***	-	T **41.5**	Claire **9.8**	Mark **2.4**	Suker **12.2**	-
Jem [60]	-	-	Mark **10.0**	Suker **12.9**	Freya **13.3**	Claire **4.3**	***Ob*** ***5.7***	Ian **13.3**	T **30.0**	-	-
Freya [53]	-	-	-	-	Suker **15.1**	Mark **17.0**	Jem **7.6**	***Ob*** ***3.8***	Ian **7.6**	T **43.4**	Claire **5.7**
Suker [58]	-	-	-	Claire **3.5**	Mark **13.8**	T **44.8**	Freya **15.5**	Jem **0**	***Ob*** ***8.6***	Ian **13.8**	-
Mark [50]	Jem **6.0**	***Ob*** ***0***	Ian **2.0**	T **58.0**	Claire **12.0**	Freya **8.0**	Suker **14.0**	-	-	-	-
Claire [60]	-	-	***Ob*** ***1.7***	Ian **6.7**	T **55.0**	Jem **10.0**	Mark **11.7**	Suker **6.7**	Freya **8.3**	-	-
Observer (Ob) [0]	-	-	Suker **0**	Freya **0**	Jem **0**	-	Ian **0**	T **0**	Claire **0**	Mark **0**	-



***Note*:** Based on observation number CA-3-B-1-1-11; 2. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 7 (N = 8) = 14.3%.

Table 5.29 TIG targeting case study [2]: Percentage of an individual's total targeting.

Participant [n]	<< Increasingly **leftwards** of targeting-producer				Opposite targeting-producer	Increasingly **rightwards** of >> targeting-producer			
Teacher (T) [110]	-	Mark **20.0**	Suker **17.3**	***Ob*** ***0***	Ian **12.7**	Freya **30.0**	Claire **20.0**	-	
Suker [37]	-	Claire **10.8**	Ian **8.1**	Mark **24.3**	Freya **8.1**	***Ob*** ***2.7***	T **46.0**	-	-
Mark [54]	-	-	-	Ian **7.4**	Claire **5.6**	Suker **20.4**	***Ob*** ***5.6***	T **55.6**	Freya **5.6**
Ian [78]	-	-	Freya **11.5**	Claire **19.2**	T **62.8**	Mark **2.6**	Suker **2.6**	***Ob*** ***1.3***	-
Claire [78]	Suker **1.3**	***Ob*** ***1.3***	T **57.7**	Freya **12.8**	Mark **7.7**	Ian **19.2**	-	-	-
Freya [59]	-	-	***Ob*** ***0***	T **71.2**	Suker **3.4**	Claire **13.6**	Ian **10.2**	Mark **1.7**	-
Observer (Ob) [0]	-	Ian **0**	Mark **0**	Suker **0**	-	T **0**	Freya **0**	Claire **0**	-

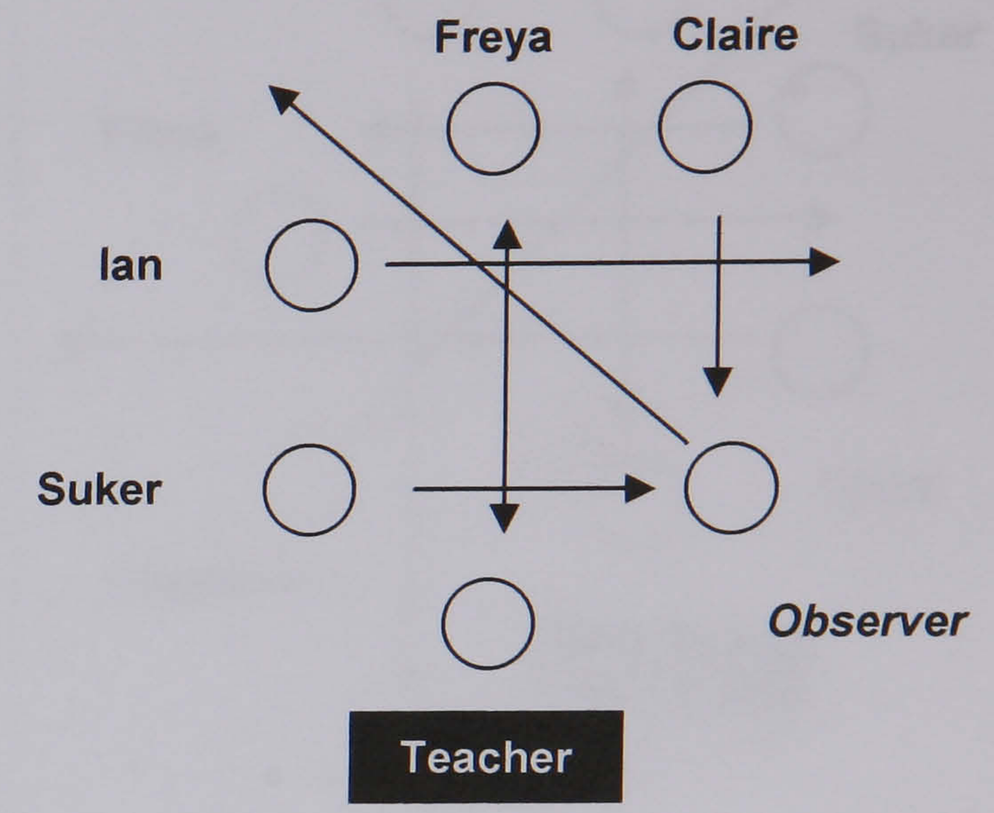


NB. Ian did not have a specific partner

Note: Based on observation number CA-3-B-1-2-17; 3. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 6 (N = 7) = 16.7%.

Table 5.30 TIG targeting case study [3]: Percentage of an individual's total targeting.

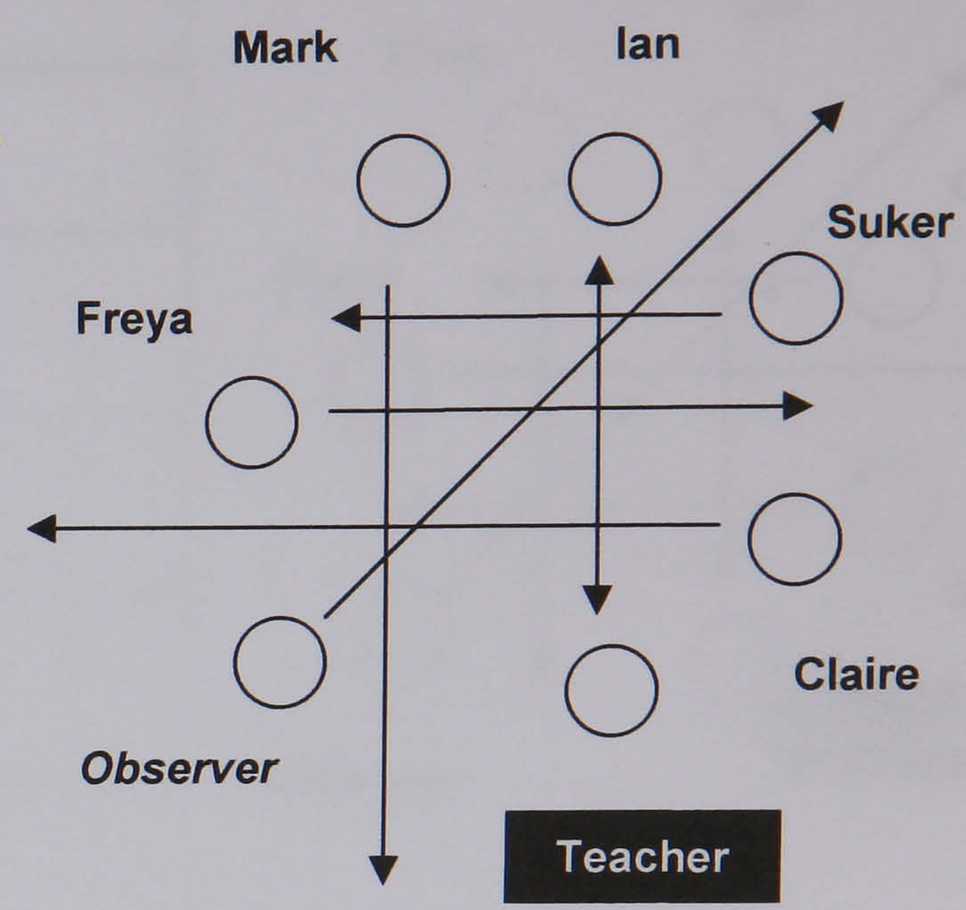
Participant [n]	<< Increasingly **leftwards** of targeting-producer			Opposite targeting-producer	Increasingly **rightwards** of >> targeting-producer			
Teacher (T) [68]	-	Ian **23.5**	Suker **26.5**	Freya **23.5**	***Ob*** ***4.4***	Claire **22.1**	-	-
Suker [49]	Claire **0**	Freya **2.0**	Ian **24.5**	***Ob*** ***10.2***	T **63.3**	-	-	-
Ian [77]	-	Claire **10.4**	Freya **5.2**	-	Suker **16.9**	T **64.9**	***Ob*** ***2.6***	-
Freya [79]	-	***Ob*** ***6.3***	Claire **15.2**	T **67.1**	Ian **7.6**	Suker **3.8**	-	-
Claire [77]	-	-	-	***Ob*** ***7.8***	Freya **3.9**	Ian **7.8**	Suker **6.5**	T **74.0**
Observer (Ob) [0]	Ian **0**	Suker **0**	T **0**	-	Claire 0	Freya 0	-	-



Note: Based on observation number CA-3-B-1-3-17; 5. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 5 (n = 6) = 20.0%.

Table 5.31 TIG targeting case study [4] up to frame 261: Percentage of an individual's total targeting.

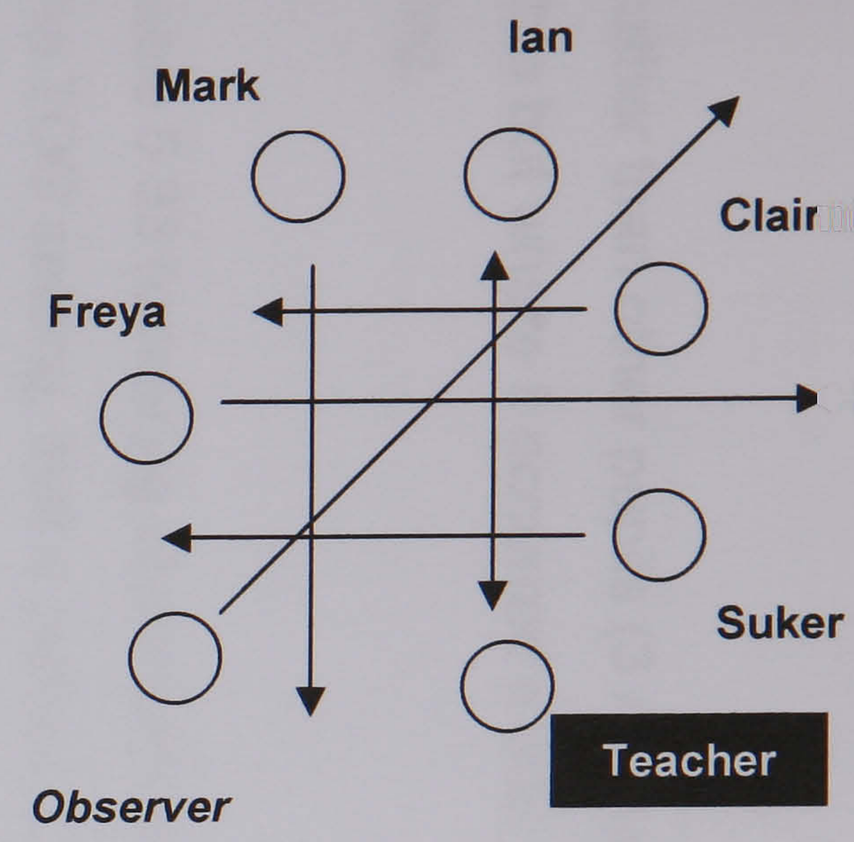
Participant [n]	<< Increasingly **leftwards** of targeting-producer				Opposite targeting-producer	Increasingly **rightwards** of >> targeting-producer			
Teacher (T) [10]	-	Mark **10.0**	Freya **10.0**	***Ob*** ***0***	Ian **30.0**	Claire **30.0**	Suker **20.0**	-	-
Freya [30]	-	Suker **1.3**	Ian **6.7**	Mark **10.0**	-	***Ob*** ***6.7***	T **73.3**	Claire **0**	-
Mark [12]	T **75.0**	Claire **0**	Suker **8.3**	Ian **8.3**	-	Freya **8.3**	***Ob*** ***0***	-	-
Ian [28]	-	-	Claire **3.6**	Suker **17.9**	T **64.3**	Mark **7.1**	Freya **3.6**	***Ob*** ***3.6***	-
Suker [25]	Freya **0**	***Ob*** ***4.0***	T **64.0**	Claire **12.0**	-	Ian **16.0**	Mark **4.0**	-	-
Claire [16]	-	-	***Ob*** ***6.3***	T **62.5**	-	Suker **25.0**	Ian **0**	Mark **6.3**	Freya **0**
Observer (Ob) [0]	-	Ian **0**	Mark **0**	Freya **0**	-	T **0**	Claire **0**	Suker **0**	-



Note: Based on Observation number CA-3-B-1-4-6; 6 – up to frame 261. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 6 (N = 7) = 16.7%.

Table 5.32 TIG targeting case study [4] from frame 261 to frame 794: Percentage of an individual's total targeting.

Participant [n]	<< Increasingly **leftwards** of targeting-producer				Opposite targeting-producer	Increasingly **rightwards** of >> targeting-producer			
Teacher (T) [72]	-	Mark **16.7**	Freya **19.4**	***Ob*** ***0***	Ian **22.2**	Suker **16.7**	Clair **25.0**	-	-
Freya [65]	-	Claire **7.7**	Ian **3.1**	Mark **0**	-	***Ob*** ***0***	T **84.6**	Suker **4.6**	-
Mark [45]	T **64.4**	Suker **6.7**	Claire **4.4**	Ian **15.6**	-	Freya **8.9**	***Ob*** ***0***	-	-
Ian [95]	-	-	Suker **10.5**	Claire **4.2**	T **70.5**	Mark **10.5**	Freya **4.2**	***Ob*** ***0***	-
Claire [74]	Freya **1.4**	***Ob*** ***2.7***	T **71.6**	Suker **13.5**	-	Ian **6.8**	Mark **4.1**	-	-
Suker [33]	-	-	***Ob*** ***3.3***	T **66.7**	-	Claire **12.1**	Ian **12.1**	Mark **3.0**	Freya **6.1**
Observer (Ob) [0]	-	Ian **0**	Mark **0**	Freya **0**	-	T **0**	Suker **0**	Claire **0**	-



Note: Based on observation number CA-3-B-1-4-6; 6 - from frame 261 to frame 794. [n] = Number of targeting-productions. Chance level for an interaction between a particular person and one other member of the group at a particular time is 1 / 6 (N = 7) = 16.7%.

partners rather than other pupils (3 / 4 instances). Attention to the observer was variable but where it occurred it was at a generally lower level than in the TOG setting.

Finally, Table 5.33 (covering observations 1- 4a), suggested, as had Table 5.26 for the TOG setting, that a particular pupil, who targeted the same other pupils in successive tasks where they were present, did so to differing extents, as had been the case in the TOG setting. Again, although superficially similar, participants were acting differently towards the same people in different group settings - further underlining the differences between

Table 5.33. Participant targeting in the TIG setting across tasks.

		% Targeting to person			
Participant	Case study	Ian	Freya	Claire	Mark
Ian	1	-	7.3	9.8	2.4
	2	-	11.5	19.2	2.6
	3	-	5.2	10.4	abs
	4a	-	3.6	3.6	7.1
	4b	-	4.2	4.2	10.5
Freya	1	7.6	-	5.7	17.0
	2	10.2	-	13.6[a]	1.7
	3	7.6	-	15.2	abs
	4a	6.7	-	0	10.0
	4b	3.1	-	7.7	0
Claire	1	6.7	8.3	-	11.7
	2	19.2	12.8[a]	-	7.7
	3	7.8	3.9	-	abs
	4a	0	0	-	6.3
	4b	6.8	1.4	-	4.1
Mark	1	2.0	8.8	12.0	-
	2	7.4	5.6	5.6	-
	3	Abs	Abs	abs	-
	4a	8.3	8.3	0	
	4b	15.6	8.9	4.4	-

Note: [a] = Partners with each other Abs = absent.

participants in the group settings.

The last case study in the TIG setting involved two pupils being moved at the direction of the teacher because, as the teacher subsequently reported, they were paying too much attention to each other and not enough to her. Comparison between Tables 5.27 and 5.32 suggested that the girl involved, Claire, did not substantially increase her targeting-to-the-teacher (before the move; 62.5%, after the move, 71.6%). The same was true for the boy involved, Suker, (before, 64.0%, after 66.7%). In terms of their targeting-of-each-other, Claire's targeting of Suker went down, (before, 25.0%, after, 13.5%) while Suker's targeting of Claire remained unaltered (before 12.0%, after, 12.1%). The teachers' targeting to both remained at similar levels (to Claire, before, 30%, after, 25.0% and to Suker, before, 20.0%, after, 16.7%). The effect of the move seemed to be greater on Claire than on Suker. Some differences were apparent in both pupils' targeting of other pupils and by them in return. However, the move did not seem to have had a major effect on the group's activity.

5.9.4 The case studies: underlying variation in the data

The two sets of case studies described above, highlighted differences between the two settings in terms of their targeting (and thus, by implication, their gestural activity). The tables also reflected the extent of variation within a group between levels of targeting and gestural activity when considered between different girls compared to each other and different boys compared to each other. This variation was apparent in all of the cases studies in both settings. Bearing in mind that mean values of particular categories of gesture, gesture-targeting and task-activity, were used for each participant type – girls, boys and teachers - this implied that the resulting means were subject to potentially wide ranges of values, that is, there was an extensive underlying

variation among participants. This may well have meant that the sample sizes were too small to reveal differences.

The case studies, although reported here at the individual participant level, have informed assessment of the groups' activity and the differences between successive observations of what was notionally the same group. They have also identified an underlying variation.

The issues that have arisen in the reporting of the observational results and the various tests performed upon them in the current chapter are discussed in the next chapter. Chapter 6 addresses the interpretation and implications of these results in terms of the research questions identified in chapter 1. It also identifies the study's conclusions, contribution to the field and its limitations. Proposals for future research conclude the chapter.

Chapter 6

Discussion and Conclusions

Chapter 6

6.1 Introduction

This final chapter summarises and discusses the findings arising from the current study. Section 6.2 summarises the research process undertaken in the study, reports the study's main findings and identifies its contribution to research. These are then linked, in Section 6.3, to a discussion of the importance of the findings in relation to the settings used in the study. Section 6.4 looks at the wider implications of these findings. A number of issues, relevant to teacher activity in the classroom are then discussed in section 6.5. The following section, 6.6, identifies the limitations of the study. The thesis concludes, in section 6.7, with suggestions for further studies.

The four research questions relating to gestures, targeting and task-activity (re-stated in section 6.2.1) are addressed in the following sections.

6.2 Summary of the research and its findings

6.2.1 Aims and research questions

The present study adopted an ecological, affordances based, view of pupil groups working in a Year 1 English Primary school classroom. The broad curriculum context was that of science-based activities. Groups of up to six pupils were observed working with their teacher who was either a visitor to the group (TOG) or a member of the group (TIG). Pupils worked around a common table upon which task materials were available. Two other

independent variables were also examined: pupil gender and the use of partnering of pupils during a task.

The study was exploratory and observation based, informed by a pre-existing tendency for people – as social observers of each other- to attend to the activity of others. In systematising this tendency (chapter 4), and focusing on gestural activity, as discussed in Chapter 3, the study argues that further ecological validity has been added to that arising from its naturalistic context – pupils and teachers interacting in a working classroom on classroom based tasks. The paucity of existing research into pupils' and teachers' gesture-use during task-activity in such groups was noted in chapter 3. The current study has gone beyond this in being classroom based, unlike the limited work, carried out previously, which was laboratory based.

Previous work on children's gesture use with adults, in learning tasks, has tended to concentrate on the use of iconic or symbolic gestures as expressed through the hands during conversation (McNeil, 1992; Goldin-Meadow, 2000). The current study has focused, instead, on broader gesture use, involving people, materials and people-and-materials as they actively engaged with physical materials. This involved attending to the gestural activity associated with, informing and supporting, the negotiation of a task to its completion (see the illustrative examples in section 6.4.1). The emphasis was, however, on gesture-use rather than the speech that sometimes co-occurred with the observed gestures.

The observations also focused on to what, or to whom, gestures were directed. Previous work (chapter 3) had tended not to report information about the targeting of gestures. Where it has been reported it tended to focus on targeting-to-people, rather than materials, or people-and-materials.

In addition, previous work had largely used the dyadic context (Ogden, 2000; and as noted by Goldin-Meadows, 2000) as the site of interactions to be

observed. Pupils in contemporary English primary classrooms spend a great deal of time in a grouped context which often involves sharing resources. The current study used a polyadic context in which to observe interactions. This represented a more realistic experience context for pupils and teachers. It also located the observation process in the same naturalistic and demanding observational context that a working teacher would experience, were she to make gestural observations of her own pupils.

The presence of others, proximal to particular interactions, offered affordances for learning and learning-from that would not be available in a dyad (participants could only learn from each other). Pupils, in particular, would have the opportunity to observe how others undertook parts of the task, in the group, before doing so themselves (see the first illustrative example in section 6.4.1).

The observations made of the groups and their teachers were examined in terms of three dependent variables. These were gestures, gesture-targets and task-activity. A statistical and case-study based approach was used. It examined participant use of particular individual categories of gesture (as gesture ensembles), targeting or task-activity. In doing so, it used the notion of examining the activity of the 'average girl', 'the average boy' and teacher in each group, comparing these across group tasks within the two teacher settings, TOG and TIG. As this approach involved the use of averaging proportional counts across girls and boys, respectively, issues of homogeneity of variance were apparent (chapters 4 and 5).

A method of comparing the results produced by this approach[1], with one that 'pooled' participant data for one participant type across a setting, coupled with a non-parametric analysis linked to the 'pooled' data, was used to examine the effect of the main approach. In the event, apart from some differences in the extent of homogeneity of variance, results were very largely consistent

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[1] As suggested by Dr. Jane Hurry, whose statistical advice is gratefully acknowledged.

between the two methods and with those of the related non-parametric analysis of the pooled data.

A second form of analysis looked at the relative frequency of use of all the categories of each variable in particular tasks in the form of task-profiles. The latter offered an overview of how particular types of participant, girls, boys or the teacher, used gesture, gesture-targeting, or task-activity, over the course of particular tasks. These profiles were created on the basis that a difference between two percentage counts for different categories of variable was at, or greater than, 10%. This criterion was arbitrary and it can be argued that a larger level of difference might have produced different profiles. Accordingly, the findings arising from this approach need to be viewed with caution.

The underlying research aim was to explore the two teacher settings (TOG and TIG) to examine gesture use, targeting and task activity. It was thus anticipated that the teacher's role in the group might be a significant environmental factor. However, it was noted in earlier chapters that the teachers in the TIG setting may have benefited from, or been influenced by, some CASE associated professional development work they had experienced, in which group management had been touched upon. This was unavailable to the TOG teachers (it had been part of the CASE project responsible for the work on the TIG tasks), and as a result might have been an unaccounted for, confounding variable. It was intended that any findings should be examined in terms of their possible contribution to classroom pedagogy. It led to four specific research questions:

(1) What gesture patterns were used by pupils and teachers during task-activity in groups?

(2) To what or to whom were gestures directed in these groups?

(3) How did gesture-use relate to task-activity in these contexts?

(4) What implications did gesture-use have for teacher management and engagement with pupils as they learned in a group?

6.2.2 Main findings

Findings from the statistical analysis in chapter 5 showed that pupil and teacher roles in a task had significant effects on their use of particular types of gesture, targeting and task-activity. They also affected the extent to which each type of activity was engaged in. When the teacher, as a member of the group, managed its activity, overall activity increased but opportunities for materials-mediated pupil gestural interactions diminished, as speech was used as the principal mode of communication.

In addition, findings showed that task-structure and organisation, particularly the issue of how task materials were to be accessed, mediated pupil and teacher use of gesture, targeting and task-activity in different teacher settings. Pupil activity became less independent and more dependent on the teacher's activity when the teacher was part of the group.

Findings from the statistical analysis and profile analysis in chapter 5 suggested some evidence that pupil gender influenced their gesture, targeting and task activity. This was not in terms of overall levels of use[2] (when partnering was not taken into account) but rather in the emphasis placed upon particular types of gesture, targeting and task activity, although this data, arising from a consideration of profiles, may be only indicative. Correlational data showed limited differences in patterns of associations for girls and boys, in both settings, there being more such associations for all participant types in the TOG setting. The direct use of materials arguably figured as mediators for boys' social interactions, and to a lesser extent for girls, in both teacher settings. This appeared to take a different form, however, when the teacher was part of the group. It is suggested that having a teacher in the group constrained boys' gestural activity to a greater extent than it did the girls'.

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[2] Although the 'Pooled' data analysis, referred to earlier, and the associated non-parametric analysis both suggested that boys showed more Using-materials activity than did girls in the TIG setting, which had not been apparent in the results of the main study.

Further findings, drawing on all the statistical results in chapter 5, showed extensive differences in girls', boys' and teacher's use of particular types of gesture, targeting and task activity when pupils were compared to their teacher and partnering was not taken into account. This was in terms of level of use and emphasis on particular forms of activity. These differences also varied according to teacher setting.

Findings from chapter 5 showed that particular types of gestural, targeting and task-activity were more common in groups when the use of Partnering was taken into account (participant type not being taken into account), and this varied according to teacher setting. These differences took different forms across teacher settings: for some variable categories the use of partnering saw increased mean use of particular categories; for others it reduced them. It is suggested that this reflected the extent to which partners were interacting with each other. However, there were no interaction effects between participant type and use of partnering in a task (chapter 5), in either setting, for any category of dependent variable.

Findings from the case studies in section 5.9 which focused on targeting behaviours showed that partners targeted each other more than they targeted non-partners. When a teacher was part of the group this effect was reduced. Teachers did not target all pupils to the same extent in a group, particularly when the teacher was a member of the group.

Findings from chapter 5 showed that one of the main engines of gestural targeting and task activity was a task requirement to share common resources. It is suggested that for boys this was a noteworthy mediating factor in their interactional activity. It was less so, for girls.

Findings from the study offered tentative support for the view that girls and boys brought different saliencies and expectations to the same group

activities. These were apparent in their use of gesture and targeting in relation to task-activity.

6.2.3 Contributions to research

The present study has made several important contributions to knowledge in a number of areas of research. These are summarised here, and support for the claims developed further in subsequent sections.

In terms of *gesture studies* (see also sections 6.3.2 and 6.4.1) it has, first, produced new knowledge about gesture production, in the form of gesture ensembles (the categories of gesture used here), in relation to the physical activity of pupils and teachers in group based tasks. It has offered the view that actions undertaken purposively during task activity may have gestural significance for others or for a person themselves. Previously research has focused on hand gestures in relation to speech in interviews as the activity context (cf. section 3.2).

Second, it has produced new knowledge about the targeting of gestures (see also sections 6.3.2 and 6.4.1) in the same context as above, by looking beyond the targeting of people alone (cf. section 3.2) to examine the targeting of task materials and other persons using task-materials as they carry out the task in the same group. Existing research has either failed to report such information or not appreciated its significance. Third, in using profiles of gesture and targeting-activity it has suggested a different perspective to that followed hitherto. The current study has focused on the balance of gestural activity in a task across categories rather than using a single category of gestural activity alone (see also sections 6.3.2, 6.3.3 and 6.4.2). Existing research (cf. section 3.2) has tended to focus on particular categories or types of gesture in isolation or specifically in relation to speech. Fourth, this knowledge has been gained in the polyadic context of a small group (see also

sections 6.3.3, 6.3.4 and 6.4.2) rather than in the dyadic or triadic contexts previously used (cf. section 3.3). Fifth, it has gathered this gestural knowledge in a naturalistic setting (see also sections 6.3.2 and 6.4.2) – a working primary school classroom - rather than the artificial laboratory based settings previously used (cf. chapter 2 and section 3.2).

In terms of primary school *groups* (see also sections 6.3.4 and 6.4.2) it has, first, extended existing knowledge about gestural interactions between Year-one English primary school pupils and their peers, and pupils and their teachers, in classroom based grouped tasks (cf. section 3.3). Second, it has used two teacher and pupil settings – the teacher as visitor to a group and as a group member. As a result (see also sections 6.3.2 and 6.4.2) it has offered insights into the impact that a teacher has on pupils' gestural interactions as a result of her continuing presence in the group (cf. sections 3.2 and 3.4). Similar studies have not previously been undertaken in this context. Third, it has generated new knowledge about pupil partnering (also see sections 6.3.4 and 6.4.5), an area previously unexamined in the context of gestural interactions (cf. section 3.3). Fourth, it has provided some evidence to support the view that girls and boys may bring different saliencies (see sections 6.3.1 and 6.4.3) and expectations to the same group activity (cf. section 3.4). This raises questions of advantaging and disadvantaging pupils by the use of particular task strategies.

In terms of *tasks* it has, first, offered new insights into possible effects of task structure on gestural activity (see sections 6.3.3 and 6.4.2), and the role of teacher management, through her involvement with the pupils undertaking it, on its level of activity and pupil interactions. In particular, the role of interactions with materials and the influence of the teacher, as mediators of task activity (see sections 6.3.4 and 6.4.2), have become more apparent (cf. section 3.4). Existing research has not explored these areas. Second, the tasks used were those that were part of the normal curriculum in each setting and had not been artificially designed for gestural observations. They therefore constituted characteristic activities (see sections 6.3.2, 6.3.4 and

6.4.2) for the pupils and teachers concerned increasing the ecological validity of the research (cf. section 3.2). Hitherto, research has tended to use novel, non-classroom based tasks as the context for study. Third, it has been proposed that centralising table resources, for a group task, can affect the nature, type and extent, of task activity occurring in the group (see sections 6.3.4 and 6.4.1). It has emerged as a potential engine of pupil interactions. This has not previously been characterised in this way and extends understanding of the relationship between task resourcing and pupil and teacher interactions. Fourth, it has shed limited light on the impact of partnering (see sections 6.3.4 and 6.4.5) as an element of task structure, in particular when the teacher's activity in the group is taken into account. This breaks new ground in this area.

In linking gesture production, targeting behaviour and task activity, the study has also shed new light on the interrelations (see sections 6.3.4, 6.4.2 and 6.5) between these two aspects of gestural activity and task activity in the grouped context, suggesting that both need to be taken into account. Gestural activity is offered as a potentially valuable index of social interactions in relation to physical and speech activity in the classroom settings studied here. It offers some potential for teachers as an index of what goes on in groups. This offers teachers two sorts of insight. First, by using gestural activity as an index of intra-group activity, they may gain insights into the effectiveness of task organisation and structure, particularly about their own role in relation to that activity. Second, they have an index of inter-pupil relations and social interaction. This could contribute to teachers' planning of activities through identifying the extent of pupils' engagement with, and accessing of, particular task contexts and in their monitoring of pupils' social development.

6.3 Contextualising the importance of the findings

6.3.1 Contexts for the findings

The research undertaken in this study has investigated two teacher settings. One in which the teacher was visitor to the group (TOG) and the other where she was a part of the group (TIG). Within these two settings the teacher had different roles. The notion of role was identified by Bronfenbrenner (1993, p85: 1994: 2001) as a key aspect of a microsystem. He noted that roles involved expectations that the person with that role would undertake particular activities and engage in particular forms of interactions with others. These expectations were held both by the person concerned and by the people they were interacting with. In this sense they were shared expectations about what people would actually do in particular situations. In the two settings of interest here, teacher and pupils had clear and different roles. However, a point not commented upon by Bronfenbrenner was that what people 'do' is related to what resources they have available to them to 'do' with. These resources include knowledge and experience as well as physical entities[3].

Subsequent sections use aspects of participant roles and their interactions with resources to contextualise, and consider, the gesture-use, targeting and task-activity noted in the current study, linked to pupil gender (section 6.3.2). The next section (6.3.3) focuses on, Task-activity, including a lack of task-activity. The type of learning afforded by the two settings, in terms of resources and task structure, and the significance of partnering, is then linked to the observations (section 6.3.4).

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[3] The possibility that the TIG teachers had a further resource at their disposable; the fact that they had expereinced limited, additional, Professional Development Work through their involvement in the CASE project (which was unavailable to the TOG teachers), should be included here and not overlooked when considering the account that follows.

6.3.2 Working in the two settings: roles and pupil gender

In the 'Teacher-out-of-the-group' (TOG) setting pupils began the task already knowing what they had to do. They had already received their instructions from the teacher as part of the whole-class group. Those instructions had been given in speech and gestures. If the task involved a particular process, as a sequence of events, this was demonstrated by the teacher as a part of her explanation of the task. This was necessary as most of the pupils could not yet read and so could not follow written step-by-step instructions. Nonetheless, each child among the group(ed) had their own individual understanding of the task and what they needed to do.

In the TOG setting, then, the pupil role was to carry out the task – themselves, or with a partner, as suggested by the higher level of Intermediary gestures, associated with the use of materials, found in this setting, in comparison with the TIG setting, and the higher level of Using-materials as a task activity (Table 5.19). They could organise it as they wished, subject to its being completed in the allotted time. Pupils knew that other pupils around the table were engaged on the same or a related activity. They had other pupils around them who had been given the same instructions should they need help (see the illustrative examples in section 6.3.2). The group was a gathering of peers among whom roles were equivalent.

In addition, the teacher could be expected to arrive with resources and help at periodic intervals (see the illustrative examples in section 6.4.1 following). The teacher role was as a source of support and source of affordance, in the form of materials and advice, but one intermittently available and thus often only a 'Presence', showing No-targeting, and No-activity (the levels of incidence of these categories in the TOG setting being much greater than those in the TIG setting (Table 5.19). Consequently, perhaps, she used Speaking as a task-activity less than her counterpart in the TIG setting (Table 5.19).

The account of the nature of the TOG teachers' role, and the initial conditions prevailing in the TOG tasks, is further evidenced in the pattern of correlations TOG teachers produced (section 5.8).When present, teachers would need to observe pupils in the group, so a correlation[4] between Looking-on and Targeting-to-People (Table 5.20) was not surprising, given their role as a source of materials and as a distributor of materials to pupils in the group. A similar correlation between Intermediary gestures, involving handling, and handing materials to people (chapter 4), and Targeting-to-People-and-materials, would also be anticipated - both were present (Table 5.20). As she would also be Looking-on, when Speaking (delivering material would also involve some speaking about them to the group or a particular child), a correlation between these two variable categories would have been expected. As handing-on of materials would also involve talking about them and what they might be used for, in this setting, a correlation between Intermediary gestures and Speaking would also have been anticipated. All of these were found to be the case (Table 5.21).

If the TOG group was working as just suggested, the teacher would be likely to talk most to pupils when present in the group, and to do so when Targeting to-People present at the table – the pupils. A correlation between Targeting-to-People and Speaking would also have been anticipated. As she might well also address the whole group, when describing materials that she had delivered, a correlation between Targeting-to-People-and-Materials (pupils would be using materials already, as they were working when the teacher arrived at the group) would also have been anticipated, as was found to be the case (Table 5.22).

Fellow pupils in the TOG groups were persons with whom negotiations would have to be made to obtain resources, because, crucially in this setting,

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[4] Correlations may indicate an association but *do not* show a causal link. They may also occur by chance, particularly where many correlations have been performed on the same data. The significance of the data informing this section was adjusted by the use of a Bonferroni correction, and by reference to the raw counts; sample sizes and the use of scatterplots (see section 5.8 and Appendix 7) were used.

resources were common and shared. The importance of the initial conditions of the task lay in their establishing the roles and relationships that would inform the task as it was carried out. The two settings permitted particular affordances for both the pupils and teachers involved in the task. The setting also directed the way each microsystem subsequently developed.

The results in chapter 5 showed that in the TOG setting pupil interactions were mainly targeted at each other rather than to the teacher (section 5.9). The results based on percentage counts showed no discernable differences in girls' and boys' use of any of the variable categories when compared to each other (chapter 5).

The patterns of correlation (section 5.8) between different dependent variable categories, in the TOG setting, showed a significant association between girls' use of Looking-on, and their Targeting-to-People where boys did not (Table 5.20). This may suggest that girls were looking, leaning, or turning towards others where boys were not to the same extent. However, both girls and boys showed significant associations between Looking-on gestures and Observing, involving looking at others, at work materials, other participants or at other's working, although the association for girls was much more significant than that for boys (Table 5.21). This would be consistent with a view suggesting that, as common materials were being used in the task in this setting, these would need to be searched for, and as they might well be being used by other members of the group; observing the activity of others would thus be necessary – this would be an issue for both girls and boys.

Girls also showed an association between Looking-on and Using-materials, involving direct interaction with materials, which boys did not show (Table 5.21). However, while girls and boys showed similarly significant associations between Targeting-to-People and Observing (Table 5.22), boys, showed an association between Targeting-to-Materials and Observing which the girls did not - girls Targeted-to-Materials when Using-materials, which boys did not show. This may reflect the field observation that boys tended to stop what

they were doing and then spend time looking at, and for, actual materials at the centre of the table, where girls tended to look for other materials while still continuing to work. Boys also showed an association between Targeting-to-People-and-materials and Using-materials which the girls did not (Table 5.22). Having stopped work and not found the needed resources, boys then tended to look at others who were still working, to see if they had the resources they wanted.

Examination of the active-profiles for the TOG groups suggested that girls and boys were showing a different emphasis for gesture and task-activity, and to a much lesser extent, for targeting. In terms of gesture profiles, girls had shown a greater tendency towards Looking-on-led, and less Intermediary-led profiles, while boys had shown the reverse (Table 5.03). When profiles of targeting were examined (Table 5.06), there was more overlap between girls' and boys' patterns of targeting with girls arguably Targeting-to-Materials directly or after Targeting-to-People slightly more than did boys. For task-activity, girls tended to show a greater tendency towards profiles where Observing and Using-materials were at similar levels compared to boys, with an emphasis on more Using-materials-led profiles, which may reflect their tendency to actually complete more of the task than did the boys, who were prone to talking, rather than working.

The findings referred to above tentatively suggest, bearing in mind the caveats about both the profile data and that arising from the correlations, that girls and boys were showing a different emphasis in the way they worked in the TOG groups.

In the Teacher-in-the-group (TIG) setting, the teacher informed the group of their mutual task, but the teacher and pupil roles were less distinct than was the case in the TOG setting. The TIG teacher managed the group's progress and offered support to pupils as the task proceeded. This was mainly achieved through a combination of observing their activity as they worked and interacted with her in the group, and mostly by Speaking to them (both

these activities were used more extensively in the TIG setting than in the TOG setting, Table 5.19).

Resources were all present on the table or introduced to the pupils as occasioned by the stage of the task they had reached. She thus controlled access to resources and their availability, and mediated their use by pupils (levels of Intermediary gestures, involving passing on of materials, were lower in the TIG setting than in the TOG setting, as were levels of pupils' Using-materials as a task activity, Table 5.19). She was also the only one who knew what was going to happen next. As such she necessarily became the focus of pupil attention (as was apparent in the case studies (section 5.9.3). In order to undertake the task, she had to be attended to and interacted with. Pupil activity would have to be greater as a result. Teacher activity would also have to be more extensive than in the TOG setting (as evidenced by the results in chapter 5).

In monitoring the group's activity, the TIG teacher would need to use Looking-on directed at the people in her group - the pupils. A correlation here, as had been the case in the TOG setting, for a similar reason, might have been anticipated and was found to be the case (Table 5.20).

The TIG teachers were distributing the materials to be used at each stage of the task (rather than, as in the TOG setting, pupils helping themselves to resources, as and when they needed them). To do so they placed them in the centre of the table space rather than distributing them around participants individually. Pupils helped themselves, but access to what was provided was still managed by the teacher. As a result her use of Intermediary gestures would be high but would not be directed at people per se. Thus whilst a relationship between Intermediary gestures and Targeting-to-People might have been expected, it would have been a negative one, rather than a positive one: she would use a lot of Intermediary gestures, by virtue of handling and placing resources on the table at each stage of the task, but this would not be directed specifically at people - the pupils. The anticipated

negative correlation was found to be the case when the results were examined (Table 5.20).

TIG teachers were distributing materials that had a role in the task that had to be explained as the task went along (TOG pupils had received their instructions before the task began). They might thus be expected to be using Looking-on when Speaking as they would be looking at the pupils they were talking to; but they would also be Looking-on and Speaking while pupils were working. (TIG teachers spoke more than their TOG counterparts had done (Table 5.19) and more than TIG girls and boys had done (chapter 5)) which might have produced a correlation. This was found to be the case (Table 5.20). As the TIG teachers had spoken more than their pupils, they would have had fewer instances of the other categories of task-activity (such as Observing and Using-materials) because the counts were proportionalised using the total observations per person.

As there was a high correlation between Looking-on and Speaking (noted above), if teacher use of Using-materials was low, which it was, a negative correlation between Looking-on and Using-materials would have been likely. This proved to be the case. The TIG teachers would also be using Intermediary gestures when Using-materials while she distributed materials to the pupils in her group, and interacted with them, in the use of the materials she was distributing. Accordingly, a further correlation should have been apparent; that between Intermediary gestures and Using-materials.

All three of the correlations suggested above were found in the results (Table 5.21.). In addition, TIG teachers who were showing high levels of Targeting-to-People and comparatively low levels of Using-materials (they had mostly been Speaking as their task activity) might have been anticipated to show a correlation between the two, but one that was negative (the pupils were still doing most of the task). This also proved to be the case (Table 5.22).

TIG pupils were not in charge of their own activity as has been implied by the last paragraph, as they been in the TOG setting. They also did not know where the task would go, as this often emerged as the task proceeded. Neither were they able to direct their interactions to whoever they pleased. In the TIG setting the teacher's control and organisation of the task, minute-to-minute constrained pupils to particular types of activity. As the case studies showed (section 5.9), pupils mainly targeted their teacher in the TIG group, and not their fellow pupils, even when partnered. The difference in pupil experience was also apparent in overall levels of gestural activity (sections 5.2 and 5.5), which shifted from Intermediary type gestures in the TOG setting towards Looking-on gestures in the TIG setting, as the task organisation required pupils to cede their activity to the teacher in her role as group organizer. Teacher profiles for gesture use suggested overlap with those of their pupils, as might have been anticipated given their mutual, but different roles, in the task themselves.

TIG teachers' role in distributing materials to pupils, which would require a greater element of Intermediary gesture use than would be needed by their pupils, was apparent in their increased use of Looking-on followed by Intermediary–led profiles (Table 5.15). Targeting profiles, as a result, should have shown a different pattern if the implied nature of the TIG teachers' role was as has been suggested above: in fact the TIG teachers Targeted-to-People and then People-and-materials as might have been expected (pupils were mainly Targeting-to-People (from the case studies, mainly the teacher) and then to materials as they carried out the task). The difference in teacher and pupil roles was shown most clearly in the Task-activity profiles (Table 5.18) which were distinctly different. Teacher profiles reflected their role as the verbal source of task organisation information, through an emphasis on Speaking-led profiles, while pupils showed their observational and responding role –responding to teacher questions – by having Observing and then Speaking-led profiles.

If the teacher's role was explicable in terms of the correlations apparent for the TIG setting as suggested earlier, was this the case for the pupils? Only one correlation was apparent when Gesture and Gesture–targeting was examined. This was for the girls (Table 5.20), and was between Looking-on and Targeting-to-Materials. As the pupils in the group were attending to the teachers' use of materials in the first instance, and then those of their peers, it might have been anticipated that boys should also have been Looking-on and Targeting-to-Materials. Both girls and boys were observing what was going on in the group (there was a significant correlation between Looking-on and Observing for both girls and boys, Table 5.21). In addition, girls, and not boys, showed a correlation between Intermediary gestures and Using-materials. It was apparent from the transcripts, and field notes, that girls tended to pass materials on to others more than the boys did (however, this had also been apparent in the TOG groups). Consistent with this observation were the correlations for the girls and boys between Targeting-to-Materials and Observing, in which the girls showed a more significant result. Girls also showed a correlation between Targeting-to-Materials and Speaking where boys had not (Table 5.22). How might these differences be explained? If girls were passing materials on more than boys, they would be very likely to be speaking when doing so - particularly if they were also talking to their teacher. If boys were doing this less often, they would be less likely to show a correlation. Given that girls also showed a correlation between Intermediary gestures (those such as handing-on) and Using-materials it might well be the case that girls and boys were working differently in the same task, although overall, they showed similar levels of Using-materials – perhaps they were using the materials in a different way and as a result interacting with other group members in a different way.

Some tentative support for this account is apparent when TIG pupil profiles were examined. Both girls and boys showed similar extents of Looking-on, followed by Indicative-led gesture profiles (Table 5.12): both were observing the task, responding to, predominantly teacher originated questions, and using pointing at the materials, to inform their answers. In terms of targeting (Table 5.15), girls tended to show Targeting-to-People, followed by Targeting-

to-Materials- led profiles where boys showed a greater emphasis on Targeting–to-People and Targeting-to-People and-materials-led profiles. Both girls and boys showed Observing and then Speaking-led profiles, with boys showing a greater tendency toward Observing, followed by Using-materials-led profiles.

These findings taken together, as was the case for the TOG setting, arguably suggest that girls and boys were working in different ways in both settings. This was apparent in both their gesture-use and task-activity, and to a lesser extent, their targeting. It may indicate that girls and boys bring different saliencies to the same task, and to different settings. Teachers in the two settings were working in different ways and this was also reflected in their gesture, targeting and task-activity.

6.3.3 Task-activity and inactivity

Task-activity was another context, in both settings, in which participant roles had a bearing (sections 5.4 and 5.7). In the TOG setting pupils used a range of different types of task-activity. In the TIG setting, in contrast, pupils largely showed Observing activity and to a lesser extent Speaking. As a proportion of total gestures these marked very significant differences with Using-materials being substantially reduced in the TIG setting. These differences were apparent for the teachers as well. Looking-on as a form of gestural behaviour increased dramatically, from TOG to TIG setting, as did Targeting-to-People and Speaking. The change in gestural, targeting and task activity related directly to the participants' roles which were different, within, and between, the two settings.

Another aspect of the roles that pupils and teachers had in the two settings was that of the task as a process to be remembered. In the TOG setting this fell to pupils to cope with. Some of the activities were comparatively long

(approximately 15-20 minutes for example) and, although they did not demand much in the way of conversational or disputational talk, exchange of knowledge or formal analysis, they were nonetheless demanding for the pupils. In addition to the process of negotiating with others and carrying out the physical work of the task, which involved decision making about resources and their use (through the affordances they offered), pupils also had to remember what to do and the order to do it in. This must have represented a substantial cognitive load.

In contrast, in the TIG setting, the teacher took on this load as she knew what the task involved but only told pupils what they needed to focus on for that particular phase of the task. This scaffolded their experience and reduced the amount they had to attend to and remember. She structured the task in discrete, short, stages. Nonetheless, this did not appear to lead to a reduction in the extent of Presence in this setting (there had been no significant difference in levels of Presence for girls and boys between the two settings (Table 5.19). If Presence reflected boredom with the task or a lack of motivation to undertake it (as will be discussed below) the directed activity of the TIG tasks might have been thought to lead to a reduction in Presence (and No-targeting and No-Activity) as might the teacher's active 'policing' of involvement with the work. Pupils would have had less opportunity to do nothing - through boredom, in the TIG setting. Task organisation, and the teacher's role in that task, could have offered, cognitive, pedagogical and behavioural opportunities that differed in the two settings.

Task non-activity, in the form of 'Presence', as a label (in the case of Gesture), came about because, in the initial observations for the study, particular pupils sometimes showed behaviours that suggested that they had come to a complete 'stop'. They literally sat still and did nothing (this was also manifest in the categories of No-Targeting and No-Activity). This could have been through boredom with the task, as suggested in the last section. It may have reflected a lack of interest in, or motivation by, the task. This explanation for 'Presence' would fit the observed behaviours: pupils did not look around;

their gaze appeared fixed on some indiscernible space. When asked later what they were doing they would say they were "…resting…", or "…thinking…" or, "…waiting…" (Although for "what", it was not clear and they could not say and they would be unlikely to say that they had been bored when approached via a direct question).

Usually pupils in 'Presence mode' were unable to say in words what they were doing, or why, during these 'stopped' moments. They may not even have been aware that they had stopped, as implied when a teacher, noting the same thing, asked the pupil concerned, very quietly, what they were doing. The pupil's face was blank and then, as though the teacher's presence suddenly came into focus for them, would answer "what?" and smile or grin. These "…offline…" (TOG1 teacher), "…gone elsewhere…" (TOG2 teacher) moments occurred quite often, particularly when the pupil was finding the task difficult (and thus de-motivating or boring?) or when they had been working for a while on the same task. However, as suggested above, the presence of the teacher in the group, and the more involving nature of the task, in the TIG setting would have been expected to reduce the levels of Presence (and No-Targeting and No-Activity) in this setting. That it did not suggests another explanation may be necessary.

This need for an alternative explanation is further supported when it was observed that teacher behaviours of this type were also apparent. They were, on occasion, showing a similar disconnection with the events in the group - perhaps they were bored too, or momentarily de-motivated by some event or pupil behaviour.

Teachers in the TOG setting were only intermittently there, and the category of Presence would not have differentiated between this and the teacher being present, in the group and doing nothing (she was literally a continuous presence in the classroom for the pupils, as indicated by their frequent scanning of the room, presumably to locate her whereabouts, as noted in Field notes). In part the more active role of the teacher in the TIG setting may

also account for a large part in the significant drop in levels of Presence(and No-Targeting and No-activity) apparent in going from the TOG setting to the TIG setting (Table 5.19).

However, it did not disappear entirely with a mean level of 17% remaining for Presence, No-targeting and No-Activity. It may be that her gaze was focused on some other part of the classroom, given her role in managing the classroom beyond the group she was working with at the time. This could not be discerned at the time. When asked afterwards, all four teachers admitted that they had moments when they momentarily disconnected from events around them. They also reported out-of-group gaze as part of their monitoring of general classroom activity while they worked with the group.

The meaning of the apparent inactivity of both pupils and teachers is, importantly, not clear in the current study. Did it represent taking time out through boredom and a lack of motivation, or is a further interpretation possible – that it represented, in some part, an attempt to narrow down or reduce distractions? This is discussed further in section 6.4.2.

6.3.4 Learning affordances: settings, 'others', materials and partners

The directed nature of pupils' activity in the TIG setting - directed to particular purposes by the teacher, had implications for the affordances offered by this context, and the 'others' involved in it, in comparison to those in the TOG setting. Any learning that this might occasion was being directed by, and specified by, the teacher rather than the children themselves. This would restrict their learning opportunities in a Piagetian sense.

However, to the extent that they were being guided by a more experienced other, it would increase their opportunities for learning in a Vygotskian sense.

They would be freed from distractions, lessening their cognitive load and their learning would be structured for them. Progression through their individual ZPDs would be supported directly. This would be through interaction with the teacher's experience and knowledge, and indirectly, through the witnessing of others' interactions as *they* progressed through their own ZPDs.

To the extent that the TIG group members' cognitions were being shared (they were not being shared in the same way in the TOG setting, except indirectly) the cognitions emerging from the group's activity in the TIG setting, were 'distributed' (Tharp and Gallimore,1988), and so offered potentially more learning opportunities. In both settings, however, learning was 'situated' (Lave and Wenger, 1991) in the particular character of the groups and their task. The issue of the extent to which particular tasks constrained the expressiveness of participants may be related to the issue of gender referred to earlier. However, if a task constrains pupils to interact, and so learn, in particular ways, it may limit the learning value of that activity. Access to resources was associated with differences in gesture-use and targeting in the present study.

Pupils' experience of resources (including 'others' - pupils and teacher as different types of resource), in the two settings, was different. This came about through pupils' different roles in the two settings. In the TOG setting pupils selected their own resources, making decisions on the basis of their affordances for a particular task. In making inappropriate choices or less effective choices, they further accessed additional affordances of the materials (what they could *not* be used for) enhancing their decision making skills and experience. These interactions were mediated through, and by, other pupils in the TOG setting. In this setting, interactions arose through negotiation for resources, which were available as overtly 'to-be-shared' resources. Pupils could also access other pupils' interpretations of the affordances of particular materials or ways of doing a particular task.

In the TIG setting the teacher mediated interactions by using speech: she also mediated pupils' interactions with materials. She further mediated their interactions with other pupils, when answering questions (many of which she originated), when negotiating access to resources and their distribution by pupils to other pupils. She also mediated the sharing of explanations.

In the TOG setting, interactions, like those in the last paragraph, had the advantage for a pupil in that she could see what was being done and interpret it for herself without making a public, and potentially embarrassing, statement of misunderstanding (as suggested by Goldin-Meadow, 2000: see also 2003 p103-131). Although this could also be done to some extent in the TIG setting, the main way in which affordances were gathered was through observation of others' activity (often the teacher's rather than other pupils') and usually mediated by speech. Here pupils were committed by the task structure and setting, to making their, possibly partly formed, understandings public. Misunderstanding would also be made apparent. This would mean they could be corrected by the teacher (unlike in the TOG setting where errors could accumulate as accepted explanations in the absence of a more experienced other with reliable knowledge). However, in the TIG setting, a pupil's lack of understanding would be revealed to all, possibly discouraging them from making a contribution.

For the teacher, the TIG setting allowed pupil understanding to be monitored more directly. Sensitivity to the gestural aspects would shed further light, for the teacher, in understanding a pupil's partly-formed understandings and ones that they could not, as yet, express in words (Goldin-Meadow 2000, 2003 p23-70). Materials and interactions with materials, importantly, offer pupils affordances for understanding the world. If interactions with that world are entirely mediated through the abstract, non-physical forms of language, and direct physical manipulation and experience marginalised, learning opportunities for pupils will be reduced. This may impact on some pupils more than others.

Finally, findings from the observation transcripts, statistical analysis (chapter 5) and case studies (section 5.9) raised a number of questions about the role of partnering in the observed tasks. In the TOG setting, pupils generally attended to their partners more than their non-partner colleagues. This effect was also present at a low level in the TIG setting but allowance must be made for the smaller number of partnerships observed in this setting.

One interpretation of this low level was that the need to attend to the teacher in this setting counteracted any inter-partner attending that was taking place; everyone in the group attended to the teacher. A second interpretation took account of a structural difference in the tasks in the two settings. In the TOG setting, pupils worked as partners throughout the task, sharing the task-activity to complete the task. In the TIG setting, however, although nominally partners in the task, pupils were, in fact, *active* as partners in only parts of the task. These were the points where the teacher directed them to work as partners. The incidence of their targeting to each other would necessarily be reduced in magnitude. The lower incidence of partner targeting to each other, apparent in the TIG setting, may simply have been due to the reduced opportunity for such targeting arising from the lack of opportunity to work as partners. This may also relate to the apparent lack of differences noted in the statistical results attributed to the use of partnering in TIG context.

The tendency to target partners (noted in the case studies), and, by implication, to be working more closely with them than with other pupils, may also help to contextualise the limited partnering-related, significant, statistical data arising from the ANOVA based analysis reported in chapter 5.

In the TOG setting less Looking-on had been apparent among participants in the task group when partnering was part of the task (there had been no interaction effects between participant types and partnering in any of the variable categories). Partners working together would need to do less looking around for resources than would two pupils working on their own, and so less Looking-on would be apparent overall in the observations of individuals in the

group, the teacher not being involved in partnering herself. In the TIG setting, Presence was more apparent when partnering was being used. This may have been because while one partner was actively working, in the TIG group, the other partner would be listening to them or watching what they were doing. As such they would be more likely to be doing nothing, and so add to an increase of Presence observed among group members-the activity of pupils in this respect not affecting the activity of the teacher.

In terms of Targeting; in the TOG setting, less Targeting-to-Materials was apparent when partnering was involved (consistent with what was suggested above as partners would need to Target-to-Materials less –together- than two individuals would alone), while in the TIG setting, No-Targeting was more apparent when partnering was part of the task (consistent with the earlier reference to TIG Presence) and there was less Targeting-to-People-and-Materials when partnering was involved in this setting (partners would be targeting each other as they worked with materials rather than any number of the rest of the group, so relatively they would target less, in this form, than when working on their own, the teacher being unaffected as she was not partnering herself.

Partnering did not affect any of the categories of task-activity in the TOG setting, but, in the TIG setting there was less No-Activity (consistent with the Presence and No-Targeting already noted for this setting) and Observing (working with a partner would mean a reduced need to observe all the others in the group compared to when pupils worked alone) when partnering was part of the task.

In all the instances referred to above, for there to be no difference between participant types, in relation to partnering, would imply that the effects suggested when partnering alone was considered, needed to be accounted for. One explanation for this might be that partnering might lead to the levels of partners' activity for that category being reduced (or increased), compared to when individual pupils were considered. This would move their

mean level of activity, for that category, towards, or away, from the mean of that for their teachers in the same category (who were not partnering any pupils), compared to when no-partnering was being used, so that no overall difference in means would result.

Teacher-setting, task-structure, task-activity, participant roles, pupil gender and, to a limited extent, partnering have all emerged as dimensions of the group(ed) and group setting explored in the current study. The following section considers these issues in a broader context, relating them to existing research.

6.4 Wider implications of the findings

The following sections address the wider implications of the findings in terms of: gestures and targets (sections 6.4.1); groups and task-activity (section 6.4.2); gender and saliency (6.4.3); apparent non-activity (sections 6.4.4) and, finally, partnering (section 6.4.5).

6.4.1 Gestures and targets

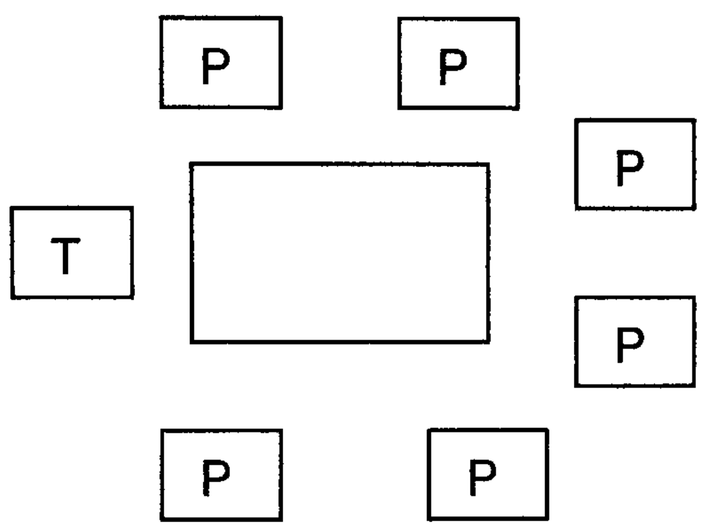
In both settings it was apparent that gestures were being used to exchange information about intentions and, as will be suggested later, understanding. This was sometimes through gesture and speech, and sometimes gesture alone (as anticipated by McNeil, 1985; 1992; 1998). Pupils and teachers were making 'excursions' (Kendon, 1978), changes in their behaviour that had meaning for others and were making gesture-related actions as defined earlier in section 3.2.5.

The use of gesture with speech in the form of hand movements, as researched in other contexts (McNeil, 1992; 2000; reviewed by Goldin-Meadow, 2000; 2003), were apparent in the polyadic settings of the groups in this study. This is a setting that is therefore one to be explored. The new approach suggested in section 6.7.2 should facilitate this type of investigation. However, this aspect of gesture and speech research was not the focus of the current study.

Gestures in this study were examined in terms of their support for, or as a means of engaging with, the task activity required of a pupil in their particular task setting. That 'intentions' for activity were exchanged was apparent in the way interchanges between pupils and teachers involved negotiation, largely though gesture. This was seen in both groups but especially in the TOG setting. Kelly and Church (1997) have noted that pupils can exchange conceptual and, pertinently here, task related, information through gestures. In the present study the exchanges were happening in real time (as opposed to that shown in a video) and with children younger than those working with Kelly and Church (ibid.).

The motive for interactions such as those above, taking a Gibsonian view, was one of needing to gain the affordances of the immediate environment from that environment, and the people and resources in it. This need to understand the immediate environment, and what it offered for action to prosecute the task in question, did not relate to a particular interpersonal attitude involving dimensions of liking-disliking or dominance-submissiveness, as suggested in some social interaction perspectives (Argyle, 1988). This approach has offered interesting explanatory possibilities (in a pedagogic context see Doherty-Sneddon, 2003) but the focus in the present study was on what was being done and what it could convey to others, rather than its association with more specific intra- and inter- personal aspects of the group's interpersonal relationships. Combining these two approaches offers a further direction for future research.

Specific gestures such as gaze were apparent in both settings. Gaze was part of the Looking-on ensemble used in the current study. Its extensive use in both settings in the current study supported Smith's view that gaze was central to interpersonal interaction in groups (Smith, 1983). The U-shaped seating arrangement, which was used in the TIG setting (proximity and spatial arrangements will be discussed below) was thought, by Sommer (1969), to be supportive of eye contact and this appeared to be the case in the current study. Looking-on activity was greater in the TIG setting than in the TOG setting. The difference here was that the U-shaped arrangement referred to by Sommer (ibid.) was of pupil *desks*, arranged so that the teacher worked at the gap in the 'U'. In the TIG groups, the U shape was apparent in the pupils' arrangement around the table:



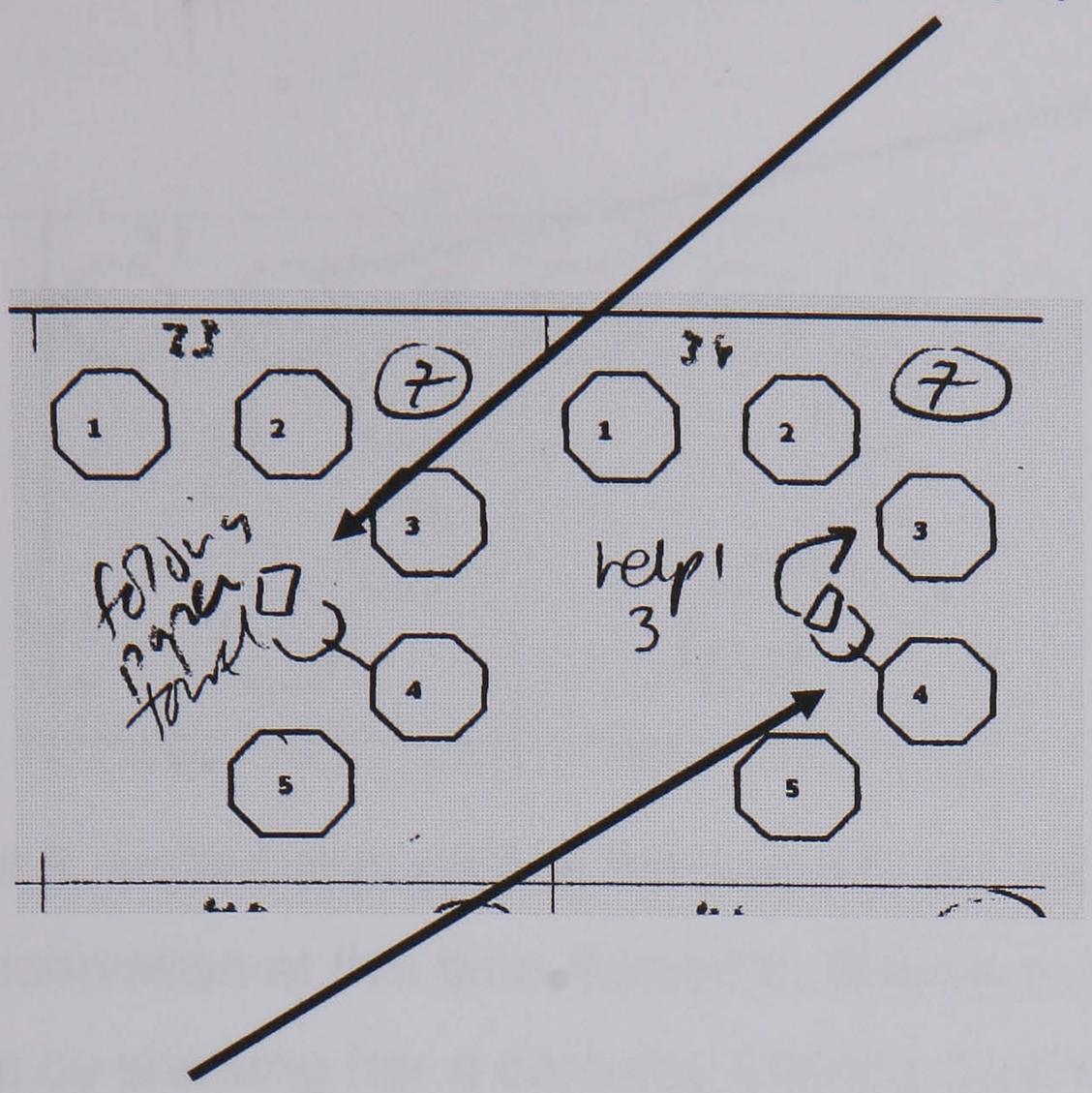
Whether through the arrangements of desks, or pupils, around the table, the effect of the grouping was to bring participants into each others' line of sight and proximity, thereby increasing the opportunities for gaze. This was more intimate in the TIG setting used here. In the TOG setting pupils could, and did, sit around the table as they wished depending on whether or not they had partners. In this context a 'U' shape with the teacher in the space was not common. The teacher, as visitor, came to rest next to a pupil rather than in one particular place. The case studies (section 5.9) suggested, but did not clearly show, that there was less cross table targeting in the TOG setting than in the TIG setting. Again the method proposed in Section 6.7.2 should allow this to be investigated in more detail in the future. It nonetheless indicates that proximity and group organisation can have effects that may influence learning, through permitting particular forms of interaction.

Both pupils and teachers, in both settings, but in different ways, modelled the relation between particular resources or stages of a process, using gestures, as suggested in terms of social learning by Rogoff (1990 p151-188; 2003 p313-317). These were specific to the context of the particular activity. Their form related to the particular resource being used. Two examples, one from each teacher setting, based on the task transcripts and field notes, serve to illustrate this.

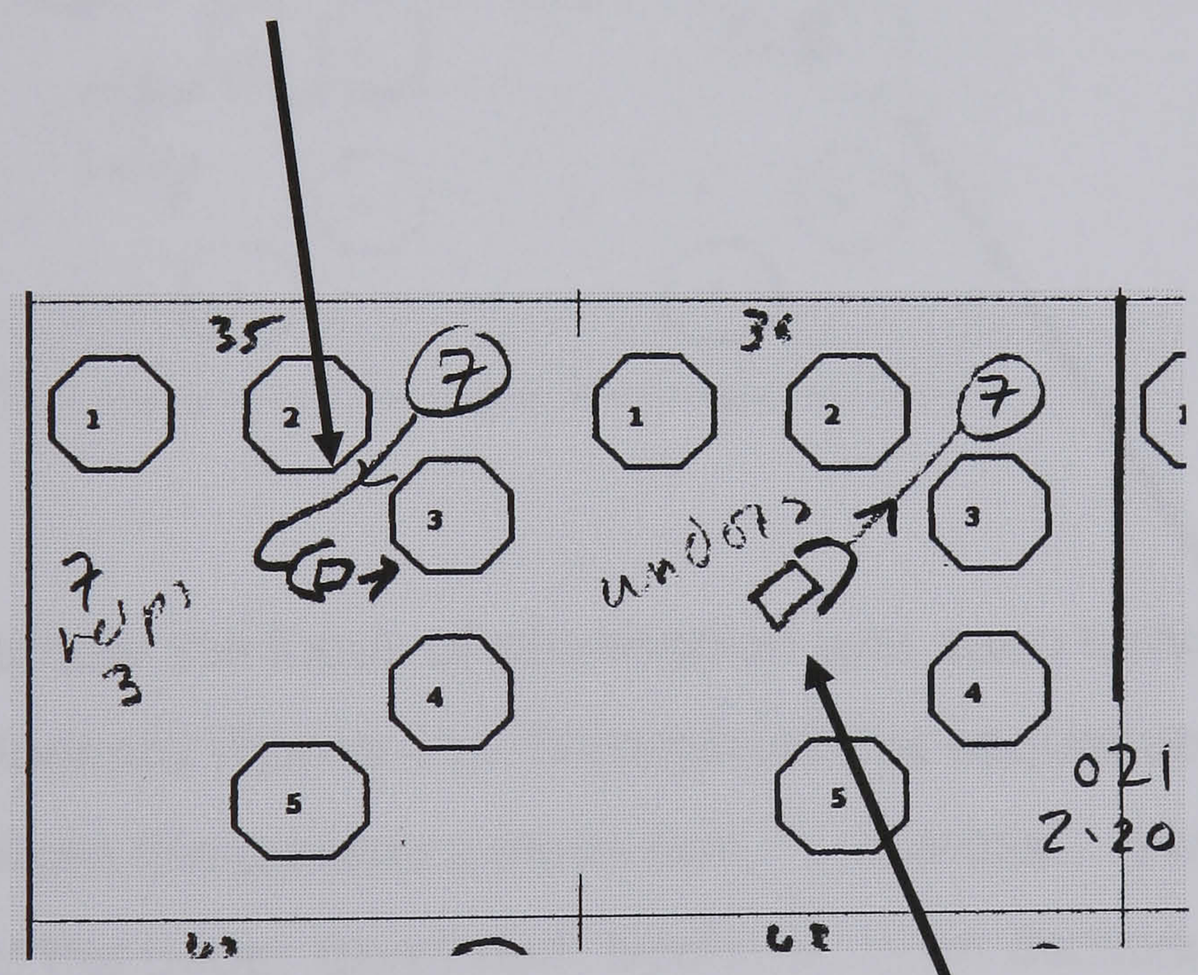
The first example, taken from a TOG task (C0-1-A-1-2-20:3, page 2, frames 33-41), was one in which children were to observe the growth of a bean seed over a number of lessons. The task in question involved setting the bean seed up in a jam jar and recording the initial appearance of the bean, before and after water had been added, using a series of labelled diagrams like the frames of a cartoon strip (recall that the children in question had yet to master writing). This was then annotated in short sentences / keywords and the parts labelled.

The bean was held in place against the glass of the jar by a piece of paper towel folded into a cylinder and inserted into the jam jar. The process had been demonstrated to the whole class, and pupils, in their table groups, were trying to repeat the process themselves, working on their own (they were thus group(ed) but working on their own). Pupils would subsequently measure the emerging roots and stems, and then compile class results for work in their maths lessons. We join the transcript in the 20-second observation cycle that had begun at 2.1 (2 minutes and 20 seconds into the observation). Previously pupils [1] to [3] had been sniffing, and examining, the beans that they were to use in the task.

In frame 33, pupil [4], Karl, had begun folding the paper towel into a cylinder and

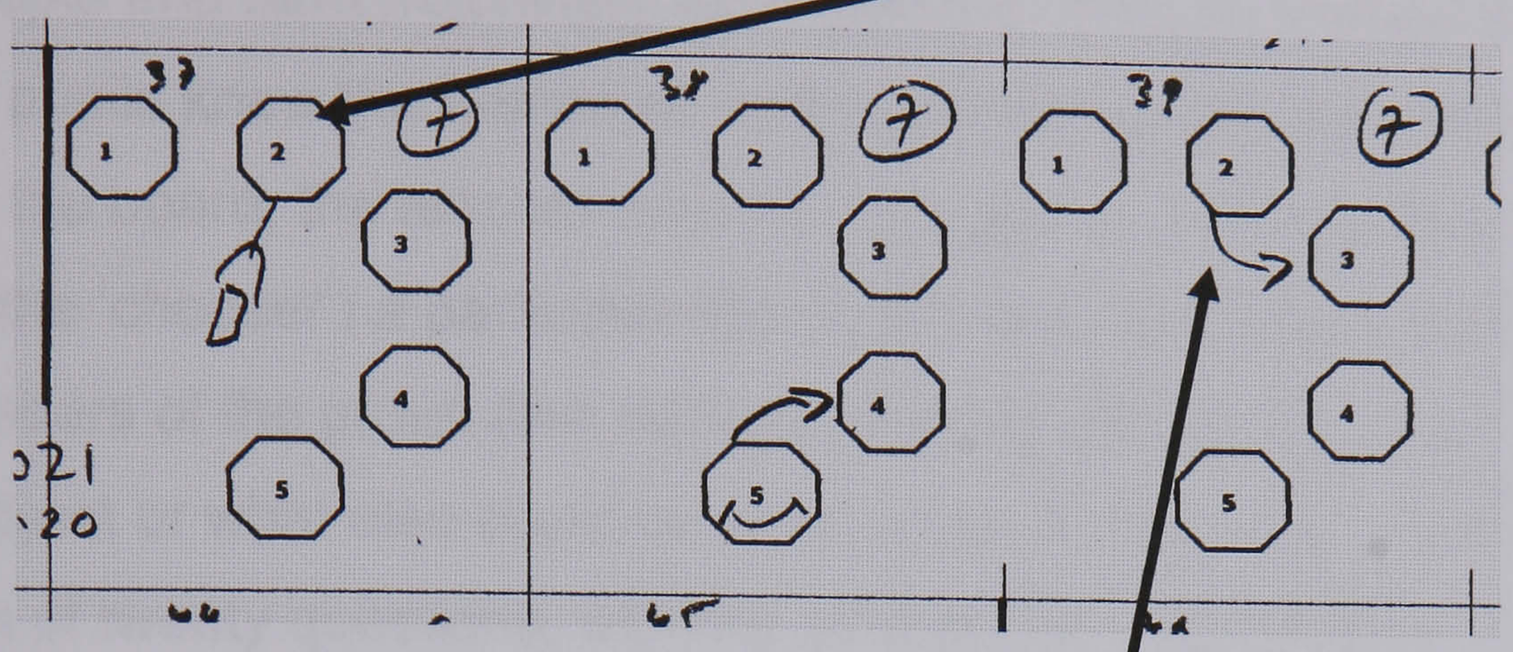


turned to show pupil [3], Shereece, who, while Karl [4] was the focus of observation, had also begun folding the paper towel (not shown). Seeing that Shereece [3] was presumably having difficulty, teacher [7] intervened, showing her a previously folded piece of paper towel, in the right configuration (frame 35).

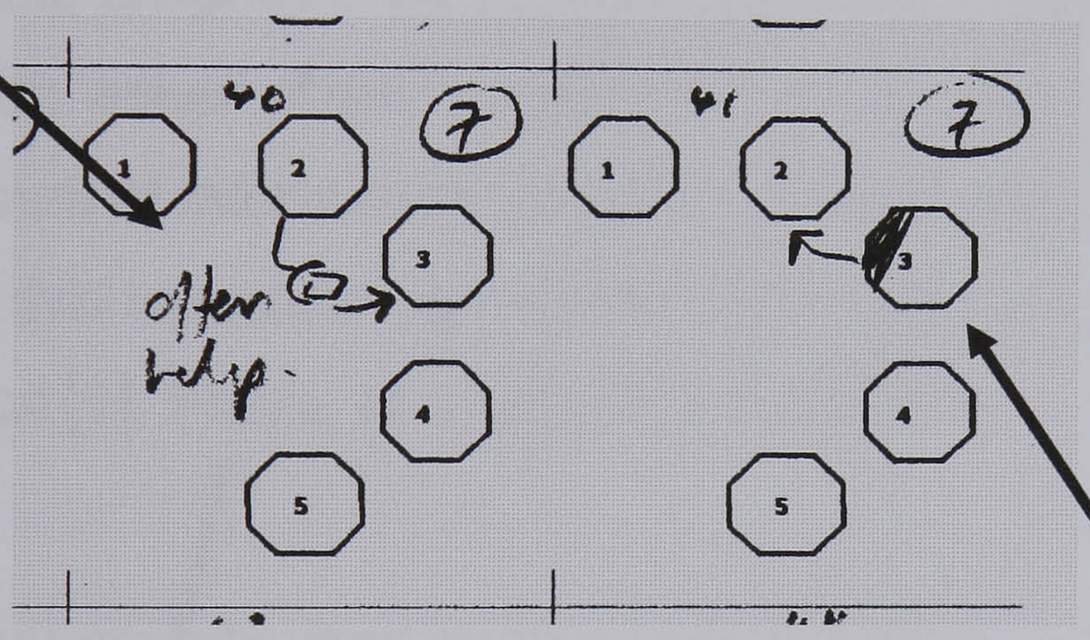


The teacher had not said anything at this point. She then undid Shereece's paper towel, and then slowly folded it into the correct shape ("…like this…"), again using no detailed *explanatory* words. The next observation cycle began at this point, 2.20 (two minutes and 40 seconds).

Pupil [1] was inactive when observed, pupil [2], Alexa, took up her paper

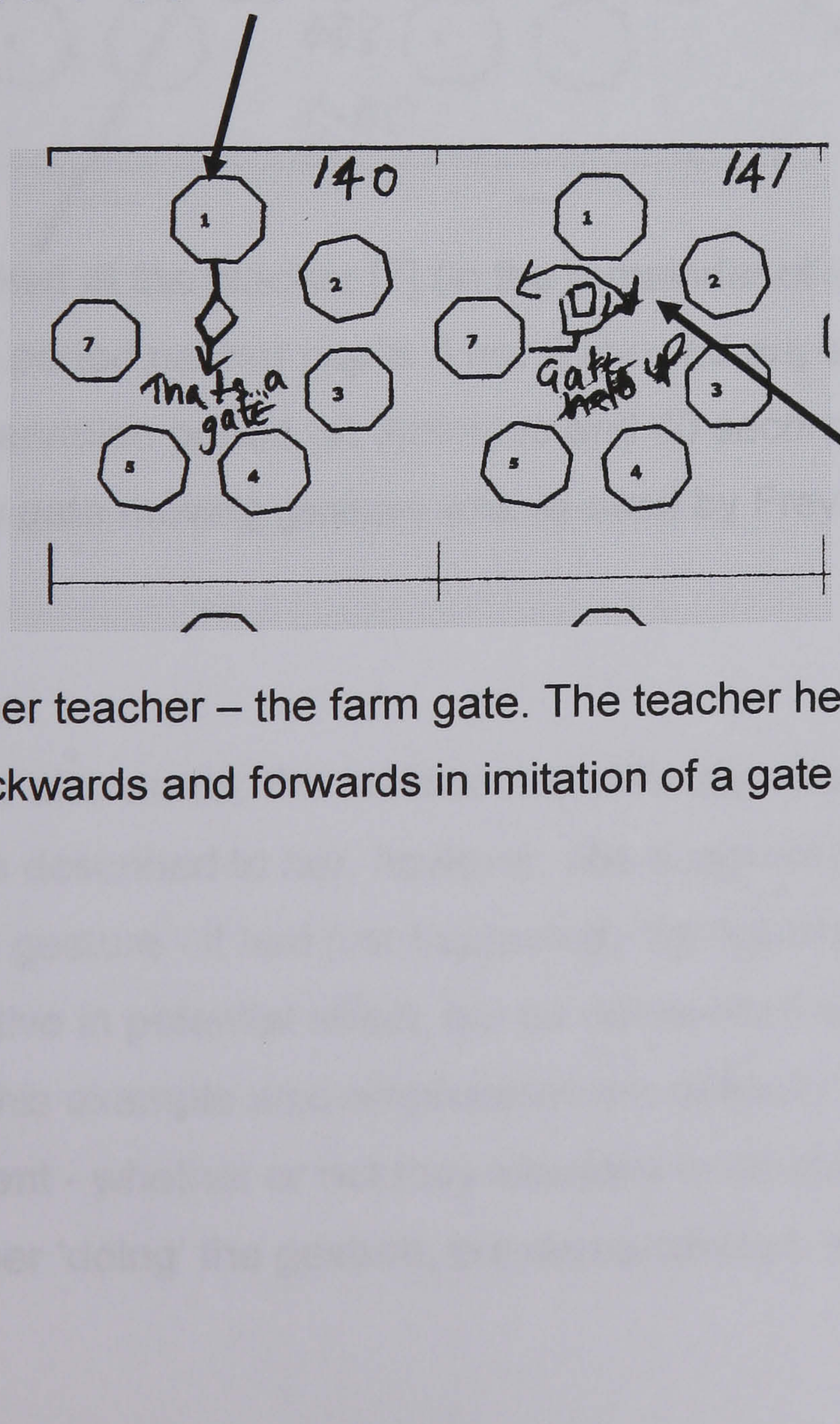


towel (pupil 5, smiled at pupil 4 at the same time). Alexa, who was still the focus of observation at this time, turned to Shereece [3] and offered her further help by showing her a correctly folded paper towel.

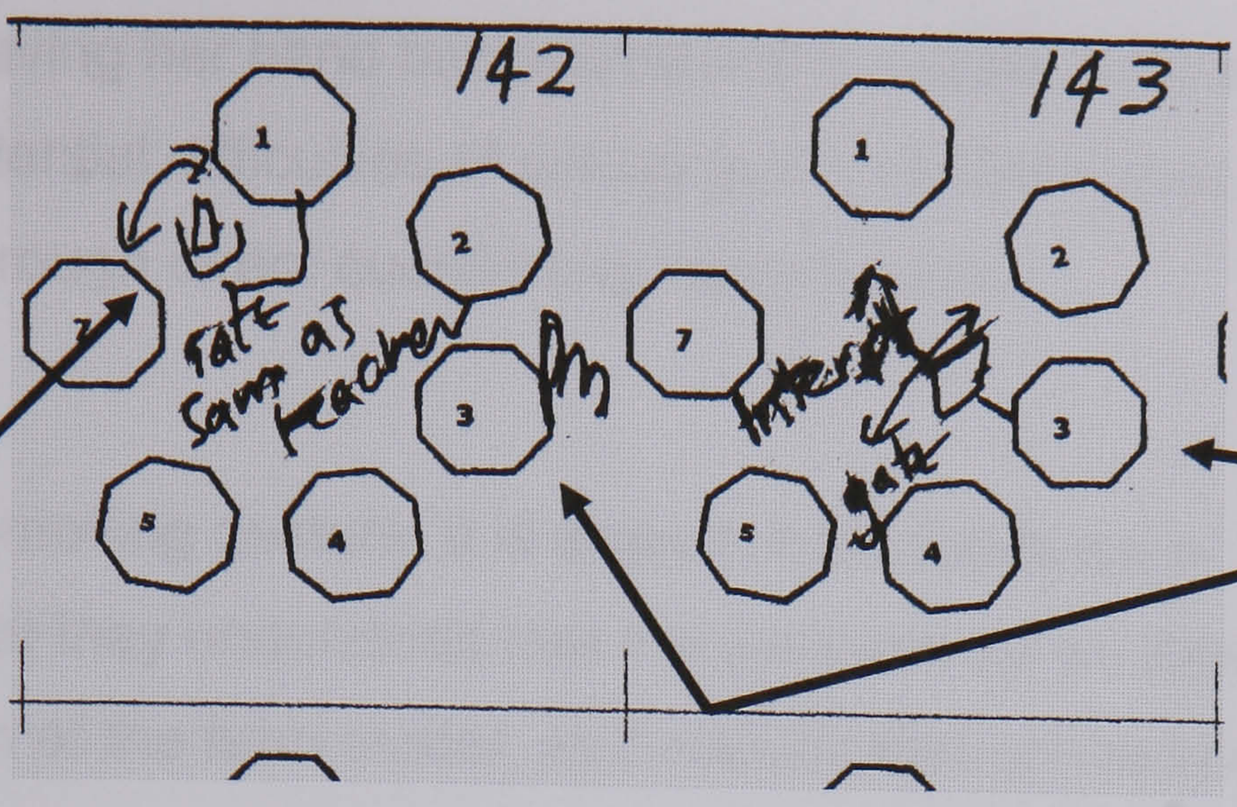


Shereece, who was now the focus of observation was seen turning to towards Alexa and leaning forward (frame 41). Throughout this sequence, no words of explanation (apart from the teacher's injunction, "…like this…") had been used. The folding of the paper towel had, however, been demonstrated through gestures, as a process, by the teacher, supported by examples of correctly folded towels provided by other pupils. Here gestures, as described in the present study, were being used to convey process information, appropriate to the task and context (how the towel should be folded) and done so in a group based way (although the pupils were notionally working on their own, their activity was available to all in the group, should individuals attend to it). The teacher had also explained through showing rather than using words. She had done this with apparent communicative intent. Here gestures were replacing, and standing-in-for, speech.

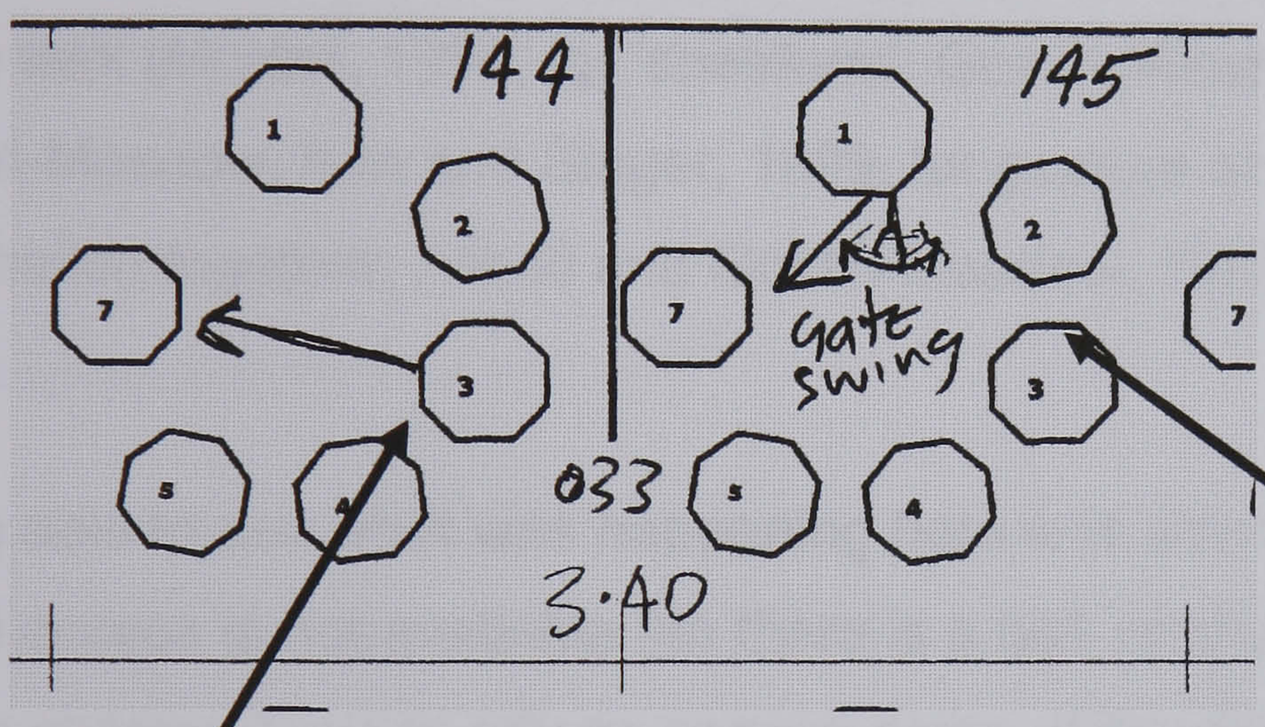
In the second instance, in a TIG setting, the pupils were presented with a model of a farm on a board. Small plastic models of the farm buildings, animal, people and farm machinery were present. After an introduction to check that pupils knew the names of, and could recognise, the various objects on the board, the teacher introduced a 'game'. This involved a person choosing (the 'chooser') a particular object, in a particular place on the board. Other members of the group (the 'askers') then asked the 'chooser' what was near the object or what else could be seen, in its vicinity by the 'chooser'. It was a form of twenty questions, with the twist that the 'questioners' had to be able to imagine themselves in the same spatial position vis-à-vis the board as the 'chooser' and tailor their questions accordingly. If a child was having difficulty framing a question they were allowed to move to a position behind the 'chooser' to check that their question made sense. This might seem a difficult task but the children in the groups generally managed it well after a few goes. As each 'asker' posed a question, and received the 'choosers' answer, the amount of information about the 'choosers' chosen object, mounted up. On this occasion (taken from task Ca-3-B-1-4-6;6, frames 140-145, page 6) pupil [1], Freya, had identified the object



chosen by her teacher – the farm gate. The teacher held the gate up moving the gate backwards and forwards in imitation of a gate opening and closing.



Freya [1] then took the gate and repeated the same gate swinging gestures, putting the gate down and continuing to swing the gate. Pupil [2], James, showed no activity, and then Pupil [3], Ian, put his hand up and asked a question about the gate, using the same gate-moving gesture.



He then looked at the teacher [7] (in the remainder of this 20 second observation period neither pupils 4 nor 5 showed any activity). In the next 20-second observation period (at 3minutes and 40 seconds), [7] having been inactive, the gate moving gesture was re-used by Freya (1) as she looked at her teacher.

When asked afterwards, the teacher had difficulty recalling the sequence. When it was described to her, however, she suggested she had not intended to make the gesture - it had just happened, highlighting that a gesture may be communicative in potential effect, but be unintended on the part of the producer. This example also emphasises the difficulty of asking someone - after the event - whether or not they intended to do something. Freya [1] did not remember 'doing' the gesture, but demonstrated, when asked, how a farm

gate worked by waving her hand backwards and forwards. This also highlighted the potential difficulties of asking young children about their gestural activity through direct questioning using speech.

By using the gate-moving gesture, it is argued, both pupils were communicating that they understood that the gate was as an object and what it did in the context of the farm model, as it was located on the boundary between a path and a field and its opening and closing in relation to putting animals into the field. They were using a gesture symbolic of the gate's action, in an appropriate contextual way before putting the action into speech. Both pupils and teacher were explaining, through showing and then speaking. Speech and gesture appeared to be being used, here, for complementary, but integrated purposes; when one or both could convey the information related to the task (McNeil, 1992, for 'speakers'; Goldin-Meadow, 2000, for 'listeners'; Goldin-Meadow, Kim and Singer, 1999, for gesture and speech conveying information together; Alibali and Goldin-Meadow, 1993).

Being able to see what was happening here was obviously crucial. Where visual access is not available (so there is a lack of shared visual context) and young children have to rely on speech alone, difficulties arise in the quality and accuracy of information passed between individuals. Both pupils and teachers showed an intuitive understanding of this when they moved, or leaned, to get a clearer view. Pupils in the TOG setting also held objects up for people to see more clearly what they were doing when explaining something or asking for help (the folded paper towel, for example in the TOG illustration given above). Teachers in both settings insisted that people be able to see what was happening when explaining something. Doherty-Sneddon and Kent (1996) demonstrated the significance of this in their work on the Map Task. Here pairs of children (six year olds and ten year olds) and adults had to complete a map relying only on spoken instructions, their gestural behaviour being shielded from each other. The six year olds in the study found this very difficult when they could not see each others' gestural

activity; when they could, they found it straightforward. This effect was less pronounced with the older children and adults.

Interactions in the group in both settings in the present study allowed a common visual context for interactions and, in the TIG setting, the role of the teacher, and the extent of gaze directed to her meant that the *whole group* shared this common context in a structured and systematic way. In contrast, in the TOG setting, this same common visual context was shared only informally. However, pupils' monitoring of each others' activity, referred to in the previous section, meant that occasions for common visual attention did occur. The need to have uninterrupted and common gaze in the task should clearly be an issue for teachers in their classroom practice when designing tasks.

6.4.2 Groups and task-activity

In Doyle's terms (1983) the pupils in both settings were experiencing his three components of task purpose – producing an end product, engaging in specific operations and using resources (section 4.4.2). Pupils in the TOG setting had all these components available to them at the same time – they knew their task objective, the process to be gone through and the resources available. In contrast, the TIG pupils only found this out as the task progressed, and they accessed stage specific processes and relevant resources. In terms of acquiring the skills underlying the task process, the TOG setting offered more opportunities to use skills in particular processes than the TIG setting. This was apparent in the more hands-on gestures used in the TOG setting compared to the TIG setting.

The processes in the two settings were different. Pupils in the TOG setting produced an artefact – a poster, for example. The TIG pupils, in contrast, had only the memory of their experience because no actual physical artefact was

produced at the end of the task. The making of these experiences was apparent in their use of gesture and targeting. In the TOG setting, materials featured; they mediated gesture-use and targeting. In the TIG setting gestural activity and targeting was to people mediated by speech. The nature of the two settings, in Doyle's terms, was apparent in the gestures being used and their targeting.

Doyle put some emphasis on 'comprehending' the task which he took to mean understanding the processes it involved (1983, p162-163). TOG pupils would have had both an overview of the task organisation and an intuitive physical experience of the task. TIG pupils, in contrast, lacked such an overview and so had a more abstract, disconnected, and possibly incomplete (in the sense of lacking an overview) understanding of the processes involved. This would benefit those pupils more linguistically competent in such a setting, where explanation and understanding were mediated by the speech used. In the TOG equivalent speech would convey less of an advantage.

Doyle was also sensitive to the managerial aspects of teachers working in groups and suggested that one of their main tasks was to ensure pupils' willingness to cooperate (ibid, p179). In the TOG setting this would have been harder to do (the teacher was only intermittently present). In the TIG setting teacher control of the task ensured pupil compliance, if not cooperation. However, this was not just achieved though speech. All the teachers were able, informally, and possible unconsciously, to use gesture to influence the group's behaviour, usually through glancing, gaze or leaning. Facial expressions and head movement were also used for the same purpose. Pupils, it must be said, also used gestures to influence each other!

The two task settings involved a different balance of task components. In terms of Norman's typology of tasks (1978) (section 4.4.2) results also clearly showed that, at the practical level, the TOG tasks involved mostly instrumental and re-structuring elements as pupils chose materials and made decisions about their use. Skills were being practised and were observable by

others in the group. Their tasks involved little evidence of re-structuring activities of an abstract kind, or ones involving enrichment of current knowledge. In contrast, the TIG setting had a lot of opportunities for extension of existing knowledge and understanding, although mediated by speech. These differences, like those in terms of Doyle's view of tasks, were apparent in the type and extent of gesturing and targeting in the two settings.

Employing Edwards' perspective (1994), however, it was apparent that the two settings differed in another key way. In the TIG setting, using Edwards' stages of task-activity criteria, pupils were provided with new information about the task, albeit in stages; they were then given opportunities to try out their new understandings in a particular activity; were able to discuss and exchange views and experiences and then review them in the form of a plenary discussion at the end of the task, within the grouped context in which they had their common experience. Each of these stages offered particular affordances for interpersonal communication and thus gestural interaction expressed in gesture-use and targeting.

In contrast, in the TOG setting, while new information had been provided, it had occurred outside the group as a part of a whole class discussion. Group(ed) pupils' opportunity to try out new experiences in relation to their knowledge of the task was limited, as any knowledge or change in experience emerged during the task and was not subject to review and consolidation by the pupil or their teacher. They had few opportunities to discuss or review their activity and did not do so, in the group, at the end. Instead the plenary aspect was done at the whole class level, sometimes on the following day. Clearly the opportunities for gesture use varied and were different in the two settings. Among the three approaches referred to, here and above, that suggested by Edwards makes the gestural aspects most easily visible. This type of task view may therefore be productive in future research on gesture in groups.

6.4.3 Gender and saliency

Findings in the study suggested that there were differences in gesture use and targeting. This was arguably apparent in profiles of the overall pattern of their activity for each variable and in the associations between particular types of gesture, targeting and task-activity (chapter 5) in the two settings. In contrast, simple comparisons between mean percentage standardised counts for specific categories showed no differences[5]. These calculations were very likely affected by the considerable variation among individual girls and boys in their use of gesture and targeting in each of the tasks (See sections, 5.9.4 and 6.4.3).

There is no reason to assume that girls or boys should use the same gestures or use them in the same way even if they share a common cultural basis of experience. Each would have had different and particular experiences which may only very broadly share common elements (as the discussion in respect of facial gestures in section 4.2.8 suggested). Aggregating gesture in the way used in the initial statistical analysis would have been likely to be affected by this variation at the individual participant level (and would still have been apparent in the 'pooled data' approach run in parallel to the main approach).

Examination of the raw counts (Appendix 1) shows that there was a lot of variation between individuals, as was apparent for proportionalised, percentage data used to produce the average girl and boy results used in the calculations in chapter 5. Although as noted earlier, the pooled data approach would not be subject to the compressing of variance brought about by using averaging, as was used in the main thesis calculations. However it remains the case that both approaches (and that of the non-parametric tests on the pooled data) produced the same overall pattern of results. The pooled data did, however, demonstrate a reduced level of homogeneity (see Appendix 8) compared to the main thesis calculations and thus queried the

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[5] Except, possibly, in the case of task-activity in the TIG setting, when the 'Pooled' data approach was used.

specific accuracy of particular tests. In turn this must qualify interpretations arsing from the findings of the current study.

This variation was also apparent in the case studies (section 5.9), which showed differences in targeting-activity among individuals in the groups. When individual targeting levels were examined over successive observations they showed particular individuals did not necessarily target to the same level, in each task, or, even if the same person was present, to the same level to that person. Thus, although comparisons on particular categories give some insight into broad differences, looking at relative patterns was more useful as these showed the gestures and patterns of targeting with respect to each other, reflecting the balance of their use in particular groups.

The definition of collaborative studies used earlier emphasised a commonality of action (that of 'productive joint activity', Crooks, 2002 p162). In this sense mediated by the shared setting, the TOG setting was collaborative in the use of joint attention (on materials and materials related activity). In contrast, the TIG tasks were collaborative in their focus on common ideas relating to the use of speech in the task through conversation (e.g. Mercer, 1995).

There was evidence from the profiles of all three variables that girls and boys were working differently in both settings (chapter 5 and section 6.3.2). Tann (1981) noted that girls and boys behaved differently in groups but put this down to social conflicts and social relation differences rather than to aspects of the task they were undertaking. In the present study there was little evidence of social conflicts and yet differences were still apparent. Equally the greater aggressiveness of boys (noted also by Tann, ibid.) was not apparent. However, the more facilitative orientation of the girls, as also noted by Tann, was apparent in that they used more Intermediary gestures and Using-materials, particularly in the TIG setting, where they were more involved in handing materials around to other pupils than the boys were.

Webb (1991) suggested that variation in group size was a factor in gender differences within groups. Group sizes varied (as pupils worked in groups of 4, 5 or 6 pupils) in the present study. However, when the observation transcripts were examined, differences were apparent irrespective of the size of the group, suggesting other factors were involved.

Murphy (1997, 2000b) has suggested that girls and boys bring different saliencies to the same tasks: their perception of the task, what needs to be done in it and how, differentiates the approach of the girls and boys to the same task activity. There was evidence from the profiles and correlation studies (section 5.8) that supported such a view.

The evidence referred to in the last paragraph, showed that girls and boys worked in different ways, in the two task settings and also within the same task setting as discussed earlier in section 6.3.2. Girls and boys were showing a different emphasis but specific associations between gesture, targeting and task-activity that represented differences within and across settings. Were they approaching the task in the same way, these differences should not have been apparent.

Girls and boys may thus use different approaches, or strategies, to engage with the same task. This may reflect a different perception of what is important in the task and how it should be attended to and prioritised. For one gender or the other, in the present context, observing, for example, may have had a greater salience than Using-materials. However, that same gender, in another setting, may view its salience differently and so prioritise Using-materials.

In the TIG setting, it was also interesting that both girls and boys were receiving apparently the same emphasis in their instructions from the teacher, and yet they were approaching the task differently. It was known from the case studies that the teacher in these groups did not target all pupils to the

same extent. In the case studies, at least, this did not seem to be gender based.

For teachers the issue of the saliencies that pupils bring to common tasks should be a matter of concern as it may mean that some tasks might advantage one gender more than another. For the researcher, the present study has shown that attending to gesture in relation to task-activity can offer insights into girls' and boys' approaches to the same task. The method proposed in Section 6.6 offers a way into investigating this crucial aspect of group work further: crucial because as suggested by Murphy (2000b):

> "...these differences...may limit [their] ability to negotiate shared reference or, if negotiation occurs, can influence how social representations are taken up and are realised in the shared reference developed" (2000b, p141).

This difference in salience could lead to a failure to negotiate the common perspective that would allow girls to learn from boys and vice-versa. It may also hint at another, possibly more significant issue. If these differences are apparent among young children do they disappear over time as children grow into adults? Do female and male teachers bring different saliencies to the same task? If particular pupil genders consistently bring specific saliencies to particular tasks, and the teacher they are working with is of a different gender, does this affect what they can get from the task? Further, if saliencies are different between male and female teachers may not this affect what pupils get from a task, regardless of gender difference between pupils and teachers? These issues clearly merit further investigation.

The present study examined only groups working with a female teacher. Significantly this was because, in the initial fifteen schools observed as a preliminary to the study, only one had a male teacher working in the classroom. All the others were females. If gender saliencies are real, this may have significant implications for pupils' learning experiences and, in particular, in the current context, those of boys.

6.4.4 Apparent Non-activity

It was noted previously that pupils were spending time apparently 'offline' from the activities going on around them. The possibility of pupil boredom being an explanation was raised. This was put to one side, however, on the basis that Presence still occurred in the TIG setting: where opportunities to be bored, or to manifest behaviours that could be interpreted as such, were less apparent. In addition, teachers had also shown some evidence of a Presence effect. In the case of pupils, this was apparent for both girls and boys, and occurred across the teacher settings. Usually they were unable to say in words what they were doing or why in these 'stopped' moments. It was possible that pupils were pausing to process their most recent experience cognitively. They were literally 'catching up' with themselves.

The more demanding tasks in the TIG setting, where they were having to process new instructions, task actions and others' views, using both visual and auditory modalities, may have meant that the pupils had exceeded their capacity to process the information they were receiving (Goldin-Meadows 2000 p236), although in that setting they were primarily receiving input from their teacher. In the TOG setting they would be monitoring the other pupils and their activity, seeking materials and making decisions about their work; a different but equally demanding context. In both settings a slight looking-away was noticed. This may be a clue as to what was happening.

It is known that when adults are asked testing or demanding questions they tend to look away and appear to focus elsewhere (e.g. Glenberg, Shroeder and Robertson, 1998). One effect noted in their study was that the accuracy of question responses to difficult questions was greater, the more looking-away occurred. It was argued that looking-away and, thereby, reducing the amount of visual information coming into the brain, allowed the person to concentrate more on the task at hand. It was in a sense a way of reducing task distractions. Earlier it was suggested that gaze could support information

exchange. Here it appeared to be doing the opposite, suggesting that sometimes gaze can give too much information and become a distraction.

For the young children in the current study, whose cognitive processes were still developing, pausing in this way may have meant that they were less distracted by events around them. In fact Doherty-Sneddon, who had been involved in the study referred to earlier, has also carried out a number of investigations to explore this issue. This involved a task called the shape description task (Doherty-Sneddon, McAuley, Bruce, Langton, Blokland and Anderson, 2000). In this experiment paired children had to describe abstract patterns, present on a wooden block, to each other; one acting as a transmitter and the other as receiver. The receiver had to choose a block that matched the description they were receiving. This was a demanding task, not least because both transmitter and receiver had to convert information into a mental visual image, one to describe it and the other to visualise it, in order to make the matching possible. This would make substantial demands on their respective visual memories, as the authors noted (ibid.). Pupils performed worse when they could see each other and better when they could only hear each other. The face-to-face-ness of the direct encounter arguably making too great a demand on their 'visual sketchpad' memory (associated with both short term retention of visual memory and visual processing). In the sound only setting this was not the case so the pupils were better able to complete the task.

This interpretation was further supported by the results of a second experiment (Doherty-Sneddon, Bruce, Bonner, Longbottom and Doyle, 2002). Three and five years olds were found not to turn away when asked increasingly difficult questions in face-to-face interactions, whereas six year olds did, showing, a similar pattern to adults. The authors suggested that either the turning away to lessen processing was not fully developed at the younger age, or it was a learnt skill which had not been acquired by the younger children but had been by the older children. Equally, it may have had time to develop in the intervening year's difference. Perhaps the two teacher

settings used in the current study, proved too demanding for the pupils and they employed this averting strategy, whether as a result of development or learning, to lessen their cognitive load. It remains uncertain whether or not this is the appropriate explanation but it seems to be one that is promising.

6.4.5 Partnering

Hastings (2001), in reviewing studies of group spatial organisation noted that pairs of pupils working together (equivalent to the partners observed in the current context) showed substantial gains in time on tasks compared to pupils working on the same tasks alone but in parallel. It should be borne in mind, however, that the pupils in question were slightly older (7- 8 year olds). Unfortunately the extent to which shared resources were involved or the precise nature of the tasks during which these observations were made is not clear.

Hastings' work on the effect of rows and groups as seating contexts for interaction, in terms of time on task, has shown that this was greater when pupils were in rows rather than in groups (Hastings and Schwesio, 1995; discussion in Hastings and Wood, 2002, p31-44). He and his colleagues had argued that these effects were different for different types of pupil. Easily distracted pupils benefited least from being in a group(ed) setting and most from being in a row. However, it appears that the pupils in the group context (group(ed) in terms of the current study) being discussed by these authors were working on *individual* tasks. Neither was it clear on what basis they were easily distracted – was it as a result of verbal or gestural interactions or did the distractibility arise from the pupils themselves. The current study has shown, in focusing on gestural-activity in task-activity that interaction among partners in a larger grouped setting, mediated by a need to share resources, merit further study.

The current study did not examine possible gender effects among partners because sample sizes within pairs were too small for comparison. However in the light of the preceding paragraphs in relation to gender, it might be suggested that pairs of pupils of the same gender may bring common saliencies to working together. This in turn suggests a strategy whereby pupils of the same gender would work together and then share their learning experience with groups of the opposite gender. This would allow both girls and boys to benefit, on the one hand, from common saliencies, and to be challenged, on the other hand, by different saliencies. The issue of partner interaction and the question of saliency offer another direction for future research. It is also one that could be investigated by the methods proposed in section 6.7.

6.5 Issues for teachers

A number of issues relevant to the pedagogic activity of teachers, in working classrooms, arose in the discussion presented in section 6.3 and 6.4. Teachers should give thought to how the process of a task is made consistently available to pupils working in a group(ed) setting. As pupils principally interact with each other in such a setting, one pupil's misunderstanding of the task may go uncorrected if teacher contact is infrequent. A sudden rise in interactions in the group may signal uncertainly as to what to do next.

Further, the opportunity to engage physically with materials in a task may carry significant affordances for pupils at this age. Even in teacher directed and managed tasks opportunities for pupils to explore resources directly should be built into task structures as should the opportunity to engage in social sharing.

In addition, teachers should be aware that the issue of interacting with materials may be more of an issue for boys than girls. Restricting such interactions may affect boys more than girls. Equally boys may need to be encouraged to be more involved in distributing materials within a group if social interactions are to be encouraged.

In terms of targeting of gestures and thus attention, teachers were the main focus of such targeting in the TIG groups of this study. Even when other pupils were active, pupils tended to target the teacher. Teachers may wish to be aware of this and ensure that pupils, who should be the focus of targeting and attention, are attended to by all the pupils in the group.

When a teacher plays a prominent role in a group she tends to use speech as the main channel of communication. The present study has shown that a lot of the social interaction in task groups of the type used in the current study took the form of gesture-mediated or gestural interactions. Teachers may wish to increase their sensitivity to the occurrence of such activity and to be aware of their own activity in this respect and what it may convey to their pupils. Teacher's prolonged participation in a group tends to limit the children's opportunities for independently motivated task-activity. This also limits the associated gestural and targeting activity. Teachers should ensure that opportunities for independent pupil activity are built into such task settings.

The study has shown that pupils may spend significant amounts of time cognitively digesting their recent experience, made manifest by periods of being "offline", as represented by the gestural category of 'Presence' in the current study. These episodes may be necessary as part of the cognitive processing of recent learning or as a way of excluding distractions when thinking. As such, teachers may wish to build into task activity structures opportunities for pupils to reflect upon their current learning experience frequently. As teachers appear to engage in the same activity, they, too, should be aware of these 'offline moments' in their own behaviour.

Findings from the study suggest that teachers should be aware that their direct involvement with a group changes its dynamics and, though their structuring of the activity and its management may enhance interactional learning opportunities for some pupils, it may reduce them for others. These differences may be apparent in the form of gestural interactions and patterns of targeting to be seen occurring in the group as it is working.

For practising teachers it was apparent that the two settings offered different learning contexts and opportunities – the TOG setting was interpretable as largely Piagetian, exploratory, independently action focused and requiring socially mediated, materials linked interaction at the individual level. The TIG settings were 'more-experienced-other' mediated, Vygotskian, constructivist and scaffolded and offered fewer opportunities for independent interaction as pupils' learning was constrained to particular types of learning interaction and learning processes. As such, teachers need to be aware that different pupils might respond to these different settings in different ways: learning opportunities being enhanced for some and reduced for others with the two settings offering different affordances for girls and boys.

Findings suggested that the need to share resources occasioned extensive gestural and targeting activity (and thus social interactions) around materials which had to be negotiated for among other pupils. Teachers should note that if reduced social interaction were desired, providing each child with a complete set of task resources, would, on the basis of the present study, be likely to reduce such interactions. This may be more significant for boys' activity in such a group: much of their negotiation for shared resources was found to be associated with Speaking as an activity. However, if a desired aim for a particular group's activity was greater social interaction; requiring pupils to share resources and negotiate with each other for access to them should be considered as part of the task structure. Teachers should be aware, however, that this may offer different affordances for girls and boys.

In terms of pupils gaining experience in assessing the intentions of other pupils another issue is apparent. If a teacher has a prominent or persisting role in a group and, as a result, is the principal focus of the groups' targeting, pupils may spend their time trying to identify *her* intentions. This would be at the expense of attending to those embodied in the task itself or those afforded by other pupils.

Teachers should note that where partnering was used in the tasks in the current study, the partners attended to each other to a greater extent, in both of the two settings. Arranging for pupils to work as partners around a common table may ensure a higher level of work and task involvement among the partners than when working alone on the same task.

6.6 Limitations of the study

A number of limitations were apparent in the study. The first of these was that the sample sizes used, although relatively large in terms of much existing gesture research, only yielded 13 TOG groups and 12 TIG groups for observation purposes, allowing for missed observations. These were based upon two notionally consistent groups in each classroom setting. These were observed a number of times in succession.

In addition, a second issue was that the overall study focused its analysis at the group level rather than on individual interactions, within specific groups. This had a number of consequences. When the mean for pupil-types in each group was calculated, it would have been subject to variation for the girls' and boys' means within the group. Within a group, as sample sizes were very small (maximum pupil group size was 6 pupils), the means involved could be easily swayed by the variation in the range of contributing individual values.

Aggregation across settings would further exacerbate this effect. The apparent lack of difference in the comparison between girls' and boys' mean use of category variables, recorded in the study, may have been due to the effect of these overlapping ranges and a consequential lack of discrimination in the related tests. This concern about the extent of homogeneity of variance underlying the data, and the way it was used in the calculations necessarily qualifies the results and their interpretation.

The single teacher involved with the group would not have been subject to such a variation. When these values were aggregated across the groups for ANOVA purposes, the pupil-types values would have been subject to this variation as well as that arising between groups. The teacher's mean would have been subject to variation only across the groups and not within a particular group. If it was the same teacher, in the same group, variation in her own activity might also be apparent.

A third aspect, in terms of the ANOVA tests, when homogeneity of variance was tested, was that the pupil-type values referred to in the last paragraph would have been more likely to show a greater variance than the teacher's ones. This may have contributed to the failed H-o-V results in a number of the ANOVA tests as the differences in variance would have been more likely to be significant, the teacher mean values showing less variation than those of the pupils. This may have been an aspect of the apparent lack of homogeneity revealed in the 'pooled data analysis' as well as in the main thesis analysis.

In addition, a fourth factor was that no additional video coverage of the actual observed groups was made – as no other researchers were involved in the group: the use of a fixed camera would also have had limited value. Inter-rating options were thus limited. The lack of independent verification of observations *at the time* was thus also a limitation of the study, only partly assuaged by the use of video material taken of a group not being observed as part of the current sample, which was used for inter-rating purposes.

Fifth, the use of a participant-observer observation approach in the present study came about through the perceived intrusiveness of conventional video cameras, as suggested above. Intrusive because of the nature of the microsystem being observed and the ecological approached favoured in the study. This had the consequence that while continuous recoding of speech activity was possible, its equivalent gestural record could not be made as each individual participant was observed in turn (chapter 4). This meant that gestural activity immediately preceding and immediately following a particular observation was unknown. As a result the gestural and targeting activity reported here was intermittent and so only a sample of what took place. This also prevented a complementary analysis of speech and gesture as has been done for dyads elsewhere (McNeil, 1992; Goldin-Meadow, 2000). The use of micro-cameras and a new strategy for the use of video in such a context is given in the following section.

A further, sixth, limitation, given the ecological approach favoured in the current study, was that pupils (as key participants in the microsystem) were not given the opportunity to discuss their gestural and targeting activity themselves (as the teachers had been) and to explain its basis. This reflected their young age, queries over their observed competency to explain their actions, and time opportunities after the actual observations in the working classroom. However, a new approach, which may address this issue, is proposed in section 6.7.3.

A final, seventh, limitation was the possible cofactor effect of the limited professional development associated with the TIG teachers' participating in the CASE project, which was unavailable to the TOG teachers. Observing both TOG and TIG teachers, in their classrooms, working with groups who either did tasks with them as a group member, or with them as a visitor to the group, would mean that any such training effects would contribute equally to both types of pupil group. This would be in contrast to the approach used in

the present study where TOG and TIG teachers were only observed working with one type of pupil group.

6.7 Further studies

6.7.1 Issues for further research

These arise from the findings and limitations of the study identified earlier. Further studies should explore the relationship between type of task and gesture-use and targeting. Equally, group size may have a bearing on such interactions not least because, as group size increases, participants have more sources of gestural (and speech) communication to process. This may affect the incidence of 'Presence' as well as cross group interactions. Different patterns of resourcing should be examined to determine whether, as suggested here, the need to cooperate in negotiating resource access leads to increased and specific patterns of gestural activity and targeting. This would have a bearing on which group size was most effective in the classroom and on how groups should be organised.

For each of the investigations identified above the role of task-organisation, gender and partnering should also be investigated. Partnering may have a gendered basis. If saliency is a significant factor in pupil approaches to specific tasks, having a partner of the same gender and with similar saliency views might lead to more efficient cooperation. On the other hand, mixed gender partnerships might offer, through the availability of different saliencies, a more flexible approach to task activity, to the advantage of both partners.

Saliency of gestural action may be indicative of person-based states and predispositions and those that arise through the act of interacting with others in a group. A particular task context might offer affordances allowing particular

strategies to be employed. Resource interactions and how these are managed – and made visible gesturally – may be key factors in understanding how groups, or the group(ed), access tasks for learning. Such gesture-mediated interactions may have a broader bearing on learning styles, motivation and task efficacy, as might be anticipated from an affordances-based, ecological, perspective. This would be especially important in the classroom if gender – either that of the teacher or that of the pupils - was a significant aspect as implied by the current study.

Integration between speech and gesture modalities during group (as opposed to dyadic) interactions is clearly signalled as an area for further research. Investigation of this in working groups would shed light on the role and significance of each, particularly as indicators of pupil understanding. This would be of direct use to the classroom teacher. Accessing this important area of work would be dependent on having a methodology that was not intrusive and could deliver continuous video and sound data.

The method used in the current study accessed only the activity of the producer of excursions and not the receiver. A non-intrusive method of observation, as proposed below (section 6.7.2), would make such observations accessible to recording and analysis. It would also allow access to the spatial and proxemic aspects of such interactions linking them to how participants use the physical environment spatially. This would further inform the bioecological approach advocated here. Proxemic and spatial aspects of group and group(ed) interactions may also be an aspect of task saliency and have a bearing on which arrangement of pupils, rows or groups, is more productive.

The observation method described below would need to be informed by a way of gathering participant explanations for their actions, which could inform data interpretation. Interview approaches would need to be developed to support this aspect; one such is outlined in section 6.7.3. Such a participant perspective would further add to the ecological basis of subsequent studies.

6.7.2 Unobtrusive video-observation

In the period since the current study was started video technology has developed to a remarkable extent. The recent development of micro-cameras – with high line resolution pictures and sound quality but no bigger than 4cm^2 in area, coupled with the development of wire-less technology, in the form of Wi-Fi data transmission, has suggested an observational strategy that would address some of the limitations of the current study.

This would take the form of using micro cameras set up as small brooches (one per participant, A-D in the diagram below) that could be worn by participants on their shoulders, attached to clothes via a Velcro tab. The cameras in question contain their own power source (so no wires would present a potential hazard and would not limit participant movement, particularly for small children) and a Wi-Fi transmitter. This would transmit both video and audio recording, live, to a receiver station (X) in the same room linked in turn to a lap top with a high capacity hard disc and DVD-writing capability. The received data would be allocated to a form of display software capable of displaying multiple feeds from different cameras at the same time (Z). This combined visual output, stored on DVD and then digital disk, would constitute a synchronised database of the participants' gestural, verbal and task activity. It would not be necessary to have an observer as part of the group and, if feeds from additional cameras placed away from the group (E) or at table-level (F) activity were to be employed, no observer in the same room would be needed. The diagram (Figure 6.01) below summarises the overall setup.

All the components are currently available and with appropriate modification could be assembled. The software for presenting multiple images for analysis in this way is also available but would need modifying for the purposes described here. In order to develop this observational strategy and to pilot it in a small group context, research funding would need to be sought and is a current goal of the author.

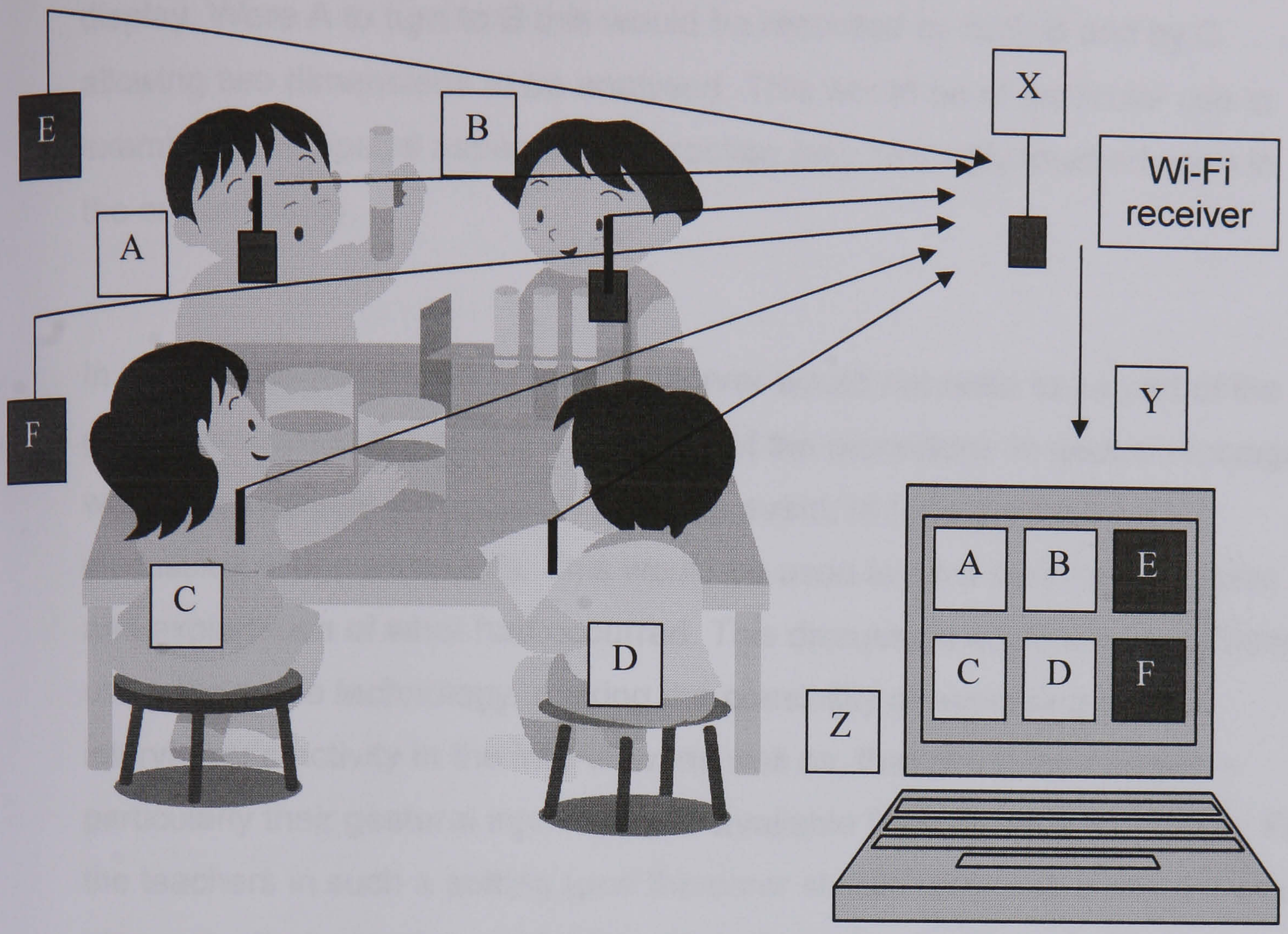

Figure 6.01 – Proposed observation strategy.

The method outlined above would provide a method for accessing, from a participant's point of view, what they directly experience, produce and receive from those around them. From an analytical point of view, analysis could proceed on the stored data focusing on gesture-associated with task-action, speech and gesture integration and speech or gesture alone. In addition it would allow direct gathering of data for studies of the role of iconic behaviour in relation to speech explanations. In this form data would also be made available, with the participants' agreement, for other researchers to use; establishing a database of naturalistically obtained and produced interactional data.

The mobility and unobtrusiveness of the methodology would allow less disturbed data than was possible in the present study. It would require new strategies for analysis as, in the example above, it would be possible to study

both A and B's interactions by examination of the juxtaposed images on the display. Were A to turn to B this would be recorded by both B and by C allowing two dimensions to be analysed. This would be of particular use in examining the spatial aspects of interaction only fleetingly touched upon in the current study.

In all such studies the participant-observer would not need to be part of the group, increasing the ecological validity of the procedure. In addition footage would be available immediately after the event, to form the basis of a discussion with participants. This would be used to elicit their interpretation and explanation of what had occurred. This discussion could itself be videoed using the same technology, making the possibility of assessing the interviewer's activity in the interview, as well as, that of the interviewee – particularly their gestural interactions – available for subsequent analysis. For the teachers in such a setting (and the carer should they wish a copy) it would also make their practice available to them in a recorded form for their own professional development purposes.

Two drawbacks are currently in prospect: first, interference from outside sources of radio emissions, such as taxis – which use the same radio wavebands as the Wi-Fi transmitters – during recording and the perhaps more important, ethical consideration of informed participation, the storage of data and its security. These would have to be addressed but should not be insurmountable.

6.7.3 Eliciting pupil understanding of gestural targeting

To elicit pupil understandings of group interactions, where the use of a written explanation would not be possible because the pupils concerned were too young (as in the current study), a new approach is proposed. This involves

using a model of a task table around which cut outs or small dolls may be placed, representing teacher, the pupil herself or other pupils and resources.

The 'interview' with the pupil starts by asking her to notice that there is a teacher sitting at the table (a teacher doll is placed at a particular position). The pupil is then given the option of placing herself any where round the table and then saying why she has chosen that particular place. She is then told that a partner is going to work with her and where would she like the partner to sit. This could be used to elicit a preferred side for interacting, left, right or face-to-face. She places it on the table and is asked why that position has been chosen.

The pupil dolls are then removed and her position around the table specified by the researcher. She is then asked what she thinks of her new position. By moving the teacher and pupil dolls into different positions the researcher can check for consistency in the pupil responses and offer the pupil different scenarios depending on the research questions.

Further possibilities arise if a pupil doll was to be placed on the table already and the pupil participant would then have to decide where she would then sit. Adding additional dolls in different positions could be used to explore how she would respond to the position of others.

Using dolls of different genders would allow exploration of gender aspects as would the specifying of friends or not-friends. The placing of resources on the table in particular positions could be investigated in terms of her strategies of positioning with respect to them. These sessions would be recorded on video, using the method outlined in section 6.7.2. This would allow a record for analysis and a way of monitoring for any cueing on the part of the researcher. Transfer of the data gathered to spatial maps or aggregating categorised observations for statistical purposes would then be possible. A wide range of investigations would be possible using this approach.

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Appendices

Appendix 1

Raw data

Table 1.01 Raw counts data for groups TOG1a1 – TOG1a4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TOG1a1														
	g	81	47	8	8	18	47	9	5	20	47	13	3	18
	g	81	48	5	7	21	48	8	5	20	47	11	2	21
	g	81	28	11	8	34	28	17	8	28	26	19	3	33
	b	81	18	12	13	38	18	26	20	17	19	16	19	27
	b	81	28	16	14	23	28	30	6	17	35	23	12	11
	b	81	35	13	7	26	35	17	8	21	35	16	7	23
	t	81	59	8	11	3	59	21	0	1	60	11	9	1
TOG1a2														
	g	67	24	7	6	30	24	15	12	16	24	10	8	25
	g	67	32	8	8	19	32	10	14	11	33	13	7	14
	g	67	19	6	9	33	19	16	11	21	19	11	19	18
	b	67	25	9	7	26	25	16	10	16	25	12	16	14
	b	67	33	8	3	23	33	7	15	12	33	12	2	20
	t	67	41	1	4	21	41	10	2	14	40	4	18	5
TOG1a3														
	g	25	9	5	1	10	9	2	10	4	9	6	1	9
	g	25	5	2	4	14	5	8	4	8	5	5	10	5
	b	25	6	4	5	10	6	10	3	6	6	8	7	4
	b	25	5	5	3	12	5	8	6	6	5	8	3	9
	b	25	6	4	6	9	6	9	4	6	6	9	4	6
	t	25	24	0	1	0	24	1	0	0	24	0	1	0
TOG1a4														
	-													

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.
'-' = No group observation took place.

Table 1.02 Raw counts data for groups TOG1b1 – TOG1b4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TOG1b1														
	g	11	4	3	0	4	4	4	1	2	4	4	0	3
	g	11	3	4	0	4	3	4	1	3	3	6	0	2
	g	11	2	4	0	5	2	5	1	3	2	6	1	2
	b	11	3	5	0	3	3	4	3	1	3	7	0	1
	b	11	1	6	0	4	1	4	3	3	1	8	0	2
	b	11	1	5	0	4	1	5	4	1	1	8	0	2
	t	11	8	1	0	2	8	1	1	1	8	0	1	2
TOG1b2														
	g	36	13	6	2	15	13	7	9	7	13	9	3	11
	g	36	13	9	1	13	13	6	12	5	13	12	2	9
	g	36	10	6	4	16	10	6	12	8	10	8	5	13
	b	36	15	13	2	6	15	8	5	8	15	5	11	5
	b	36	5	11	1	19	5	4	10	17	5	6	10	15
	b	36	12	8	1	15	12	5	8	11	12	9	4	11
	t	36	33	1	0	2	33	1	1	1	33	0	2	1
TOG1b3														
	g	28	8	4	1	15	8	4	3	13	8	4	6	10
	g	28	6	11	1	10	6	10	3	9	6	9	9	4
	g	28	11	10	0	7	11	9	1	7	11	8	5	4
	b	28	17	7	0	4	17	6	0	5	17	7	1	3
	b	28	10	6	1	11	10	6	4	8	10	3	9	6
	b	28	14	6	0	8	14	6	1	7	14	7	4	3
	t	28	26	2	0	0	26	2	0	0	26	0	2	0
TOG1b4														
	-													

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.
'-' = No group observation took place.

Table 1.03 Raw counts data for groups TOG2a1 – TOG2a4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TOG2a1														
	g	31	8	18	1	4	8	6	11	6	8	9	2	12
	g	31	4	15	4	8	4	10	8	9	4	9	5	13
	g	31	6	15	2	8	6	10	7	8	7	3	8	13
	b	31	8	13	5	5	8	9	6	6	8	6	7	10
	b	31	17	7	3	4	17	1	5	8	17	2	4	8
	b	31	6	20	2	3	6	8	9	8	7	10	1	13
	t	31	19	8	0	4	19	8	1	3	19	3	8	1
TOG2a2														
	-													
TOG2a3														
	g	25	4	10	3	8	4	8	7	6	4	10	0	11
	g	25	6	12	1	6	6	8	5	6	6	8	4	7
	b	25	3	8	6	8	3	5	7	10	3	8	8	6
	b	25	3	8	2	12	3	8	5	9	3	8	3	11
	b	25	3	6	6	10	3	4	6	12	4	4	3	14
	t	25	25	0	0	0	25	0	0	0	24	1	0	0
TOG2a4														
	g	19	4	8	2	5	4	4	2	9	4	6	3	6
	g	19	4	10	3	2	4	7	1	7	4	8	2	5
	g	19	7	5	0	7	7	1	4	7	7	2	0	10
	b	19	5	4	2	8	5	3	5	6	5	2	3	9
	b	19	6	4	5	4	6	4	1	8	5	4	3	7
	b	19	4	6	1	8	4	2	4	9	4	5	0	10
	t	19	19	0	0	0	19	0	0	0	19	0	0	0

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.
'-' = No group observation took place.

Table 1.04 Raw counts data for groups TOG2b1 – TOG2b4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TOG2b1														
	g	42	18	11	0	13	18	6	12	6	17	8	1	16
	g	42	22	8	1	11	22	3	10	7	21	7	3	11
	g	42	21	7	3	11	21	8	8	5	20	7	4	11
	b	42	21	5	3	13	21	8	8	5	21	7	4	10
	b	42	19	5	1	17	19	5	8	10	20	7	3	12
	b	42	12	12	3	15	12	10	11	9	12	10	1	19
	t	42	34	2	2	4	34	8	0	0	32	7	3	0
TOG2b2														
	g	31	16	8	2	5	16	7	3	5	15	6	3	7
	g	31	19	5	1	6	19	4	4	4	19	3	1	8
	b	31	13	10	1	7	13	3	12	3	13	5	3	10
	b	31	14	14	1	2	14	10	3	4	13	7	6	5
	b	31	15	11	0	5	15	6	4	6	15	3	10	3
	b	31	10	16	1	4	10	9	6	6	9	13	4	5
	t	31	23	5	2	1	23	5	2	1	22	4	5	0
TOG2b3														
	g	23	2	13	1	7	2	9	6	6	3	10	2	8
	g	23	1	14	1	7	1	10	7	5	0	8	5	10
	b	23	3	13	1	6	3	10	3	7	3	12	2	6
	b	23	0	15	0	8	0	9	9	5	1	14	1	7
	b	23	7	14	0	2	7	10	4	2	6	13	0	4
	t	23	16	5	0	2	16	6	0	1	17	1	5	0
TOG2b4														
	g	19	2	14	0	3	2	4	8	5	2	7	0	10
	g	19	3	13	0	3	6	6	4	3	2	9	0	8
	g	19	8	6	0	5	8	3	4	4	7	4	0	8
	b	19	4	10	0	5	4	3	7	5	6	3	0	10
	b	19	3	11	1	4	3	9	4	3	4	6	0	9
	b	19	4	10	1	4	4	8	4	3	3	6	0	10
	t	19	11	3	1	4	11	6	0	2	10	4	4	1

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.

Table 1.05 Raw counts data for groups TIG1a1 – TIG1a4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TIG1a1														
	g	79	5	55	18	1	5	24	28	22	7	65	6	1
	g	79	11	46	18	4	11	24	24	10	11	54	10	4
	g	79	13	54	9	3	13	29	18	19	15	58	4	2
	g	79	13	51	12	3	13	24	26	16	13	55	9	2
	g	79	6	41	30	2	6	25	18	30	6	60	11	2
	g	79	10	46	15	8	10	26	21	22	12	57	2	8
	t	79	10	57	4	8	10	45	5	19	11	11	54	3
TIG1a2														
	g	60	19	23	11	7	19	15	7	19	19	29	6	6
	g	60	15	30	8	7	15	17	12	16	16	27	11	6
	g	60	24	20	10	6	24	16	7	13	24	26	8	2
	g	60	20	20	13	7	20	16	9	15	20	24	13	3
	g	60	15	26	10	9	15	15	11	19	15	29	9	7
	g	60	21	30	7	2	21	16	14	9	21	35	3	1
	t	60	13	42	0	5	13	38	1	8	15	2	43	0
TIG1a3														
	g	113	32	62	16	3	32	27	30	24	33	60	20	0
	g	113	31	57	19	6	31	18	32	32	30	57	24	2
	g	113	23	66	19	5	23	31	32	27	23	78	10	2
	g	113	18	72	19	4	18	26	31	38	18	75	18	2
	g	113	18	67	23	5	18	25	43	27	18	78	14	3
	g	113	30	61	17	5	30	18	40	25	30	67	14	2
	t	113	27	79	7	0	27	73	3	10	27	21	65	0
TIG1a4														
	g	58	27	22	5	4	27	7	13	11	26	22	8	2
	g	58	25	26	3	4	25	10	9	14	25	20	11	2
	g	58	25	26	3	4	25	16	10	7	24	18	15	1
	g	58	22	29	4	3	22	15	8	13	22	20	15	1
	g	58	21	24	7	6	21	12	10	15	21	24	10	3
	g	58	22	27	4	5	22	10	10	16	22	23	10	3
	t	58	9	43	4	2	9	40	0	9	9	7	41	1

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.

Table 1.06 Raw counts data for groups TIG1b1 – TIG1b4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TIG1b1														
	g	68	19	34	1	14	19	16	13	20	19	29	10	10
	g	68	9	25	13	21	9	16	14	29	10	32	13	13
	b	68	6	35	13	14	6	27	11	24	6	29	21	12
	b	68	6	20	21	21	6	20	5	37	6	25	19	18
	t	68	14	46	1	7	14	37	4	13	13	9	45	1
TIG1b2														
	-													
TIG1b3														
	-													
TIG1b4														
	g	55	16	33	4	2	16	18	13	8	16	33	4	2
	g	55	10	29	9	7	10	22	11	12	10	28	12	5
	b	55	10	28	13	4	10	21	13	11	10	31	11	3
	b	55	18	27	7	3	18	17	13	7	18	27	8	2
	t	55	1	46	8	0	1	43	3	8	1	8	46	0

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.
'-' = No group observation took place.

Table 1.07 Raw counts data for groups TIG2a1 – TIG2a4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TIG2a1														
	g	85	20	42	11	12	20	31	15	19	19	45	9	12
	g	85	15	42	13	10	15	29	31	10	14	51	3	17
	b	85	25	26	14	20	25	33	16	11	29	30	7	19
	b	85	22	41	9	13	22	31	19	13	21	44	3	17
	b	85	20	39	21	5	20	26	27	12	17	46	6	16
	b	85	14	39	15	15	14	28	23	20	12	46	9	18
	t	85	32	26	10	17	32	34	4	15	31	17	29	8
TIG2a2														
	g	79	22	25	13	19	22	21	13	23	22	25	20	12
	g	79	30	34	8	7	30	30	10	9	31	25	14	9
	b	79	35	20	14	10	35	19	13	12	35	21	16	7
	b	79	20	27	8	24	20	21	13	25	20	27	19	13
	b	79	31	26	6	16	31	20	10	18	32	31	10	6
	t	79	18	43	5	13	18	43	5	13	18	8	49	4
TIG2a3														
	g	69	10	30	25	4	10	25	9	25	13	40	13	3
	g	69	8	32	26	3	8	25	17	19	8	42	17	2
	b	69	3	31	21	14	3	19	14	33	3	38	21	7
	b	69	13	31	20	5	13	29	14	13	14	38	16	1
	t	69	9	46	9	5	9	50	1	9	9	8	51	1
TIG2a4														
	g	73	9	43	11	10	9	27	16	21	10	45	9	9
	g	73	7	41	16	9	7	22	23	21	9	49	12	3
	b	73	7	35	24	7	7	18	17	31	7	41	22	3
	b	73	5	51	11	6	5	21	29	18	5	54	7	7
	b	73	13	35	14	11	13	19	21	20	13	43	12	5
	t	73	8	50	5	10	8	37	4	24	9	3	55	6

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.

Table 1.08 Raw counts data for groups TIG2b1 – TIG2b4.

Task setting and group	Participant type	Number of observations in each task	Number of observations counted in each gesture category				Number of observations counted in each gesture-target category				Number of observations counted in each task-activity category			
			P	L	I	In	Nt	Pt	M	Pm	Na	O	S	U
TIG2b1														
	g	92	21	34	19	18	21	23	23	25	21	44	19	8
	g	92	35	36	10	11	35	18	24	15	35	48	3	6
	b	92	27	33	13	19	27	16	21	28	27	46	18	1
	b	92	29	41	12	10	19	19	16	29	29	54	2	7
	b	92	19	35	9	29	19	31	16	26	19	32	34	7
	t	92	11	69	3	9	11	52	7	22	11	8	72	1
TIG2b2														
	-													
TIG2b3														
	g	62	16	34	9	3	16	17	13	16	17	34	7	4
	g	62	11	42	7	2	11	22	20	9	12	43	4	3
	b	62	3	28	21	10	3	19	11	29	7	28	15	12
	b	62	6	33	20	3	6	19	14	23	7	40	8	7
	b	62	4	34	16	8	4	23	20	15	4	34	12	12
	t	62	6	40	5	11	6	31	4	21	7	7	45	3
TIG2b4														
	-													

Notes: Participant type: g = Girl pupil; b = Boy pupil; t = Female teacher. Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials.
'-' = No group observation took place.

Appendix 2

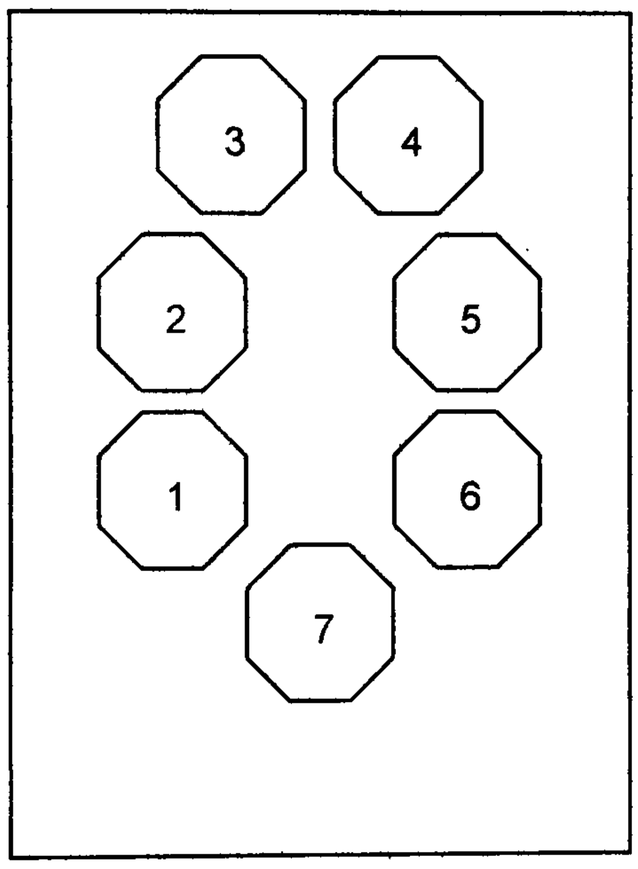
Transcription materials

Summary of Transcription.

1) The data from the audio tape, which constituted a recorded narrative of observations informed by the gesture categories referred to in the last chapter, was played back.

2) It was transferred to a prepared grid in which each gesture of the gesture cluster made by an individual during the observation was added to a single frame of the grid. The frame represented a 'birds-eye' view of the task table with participants sitting around it represented by a number octagon (Figure 3.01). Pupil participants were number 1 to 6; the teacher, 7.

Figure 2.01
Representation of 'bird's eye' view of group.



3) Each gesture was represented by an iconic symbol (see following section) that depicted the gesture in question. The successive gestures made by a person in the observed gesture cluster were added to the grid sequentially in the order that they were 'voiced' on the audio tape. Where no gestures were recorded the octagon for that participant was left blank. The coding symbols used are shown in Figures 3.02 and 3.03. Examples of blank recording sheets are shown in Figures 3.04 and 3.05, and an example of a completed, transcribed sheet with explanatory text, is shown in Figure 3.06.

4) The twenty second interval that bounded the observation period was marked on the grid by red lines. The frames contained within this boundary constituted a **group gestural observation unit** (e.g. A-B in Figure 3.06). It

contained the gesture clusters observed for each gesturing participant and represented a sampling of their gestural behaviour in that period. They *did not* represent a sequence *between* individuals but rather constitute snapshots of an individual's behaviour during the observation period in terms of gesture-types and gesture-targets.

5) The resulting transcript embodied a sampling of the gesture types, gesture targets and spatial distribution of gestural behaviour for each individual.

Figure 2.02 Gesture category and transcription codes.

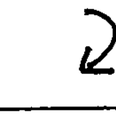
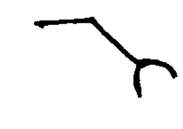
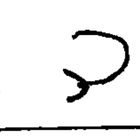
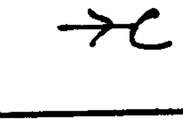
Gestures and codes			
Gesture	Code	Gesture	Code
Smile		Frown	
Eyebrows raised		Eyebrows lowered	
Nod-of-head: up, down		Shake-of-head: side to side	
Head turned to left		Head turned to right	
Head leaning back		Head leaning forward	
Gaze to left		Gaze to right	
Gaze downwards		Gaze upwards	
Leaning to left		Leaning to right	
Leaning back		Leaning forward	
Turning to left		Turning to right	
Turning around to the left (swivelling in seat)		Turning around to the right (swivelling in seat	
Whole arm moving upwards		Whole arm moving downwards	
Whole Arm moving left		Whole Arm moving right	
Whole Arm moving back		Whole Arm moving forward	

Figure 2.03 Gesture category and transcription codes, contd.

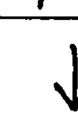
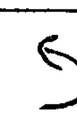
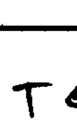
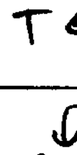
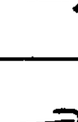
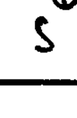
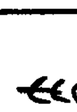
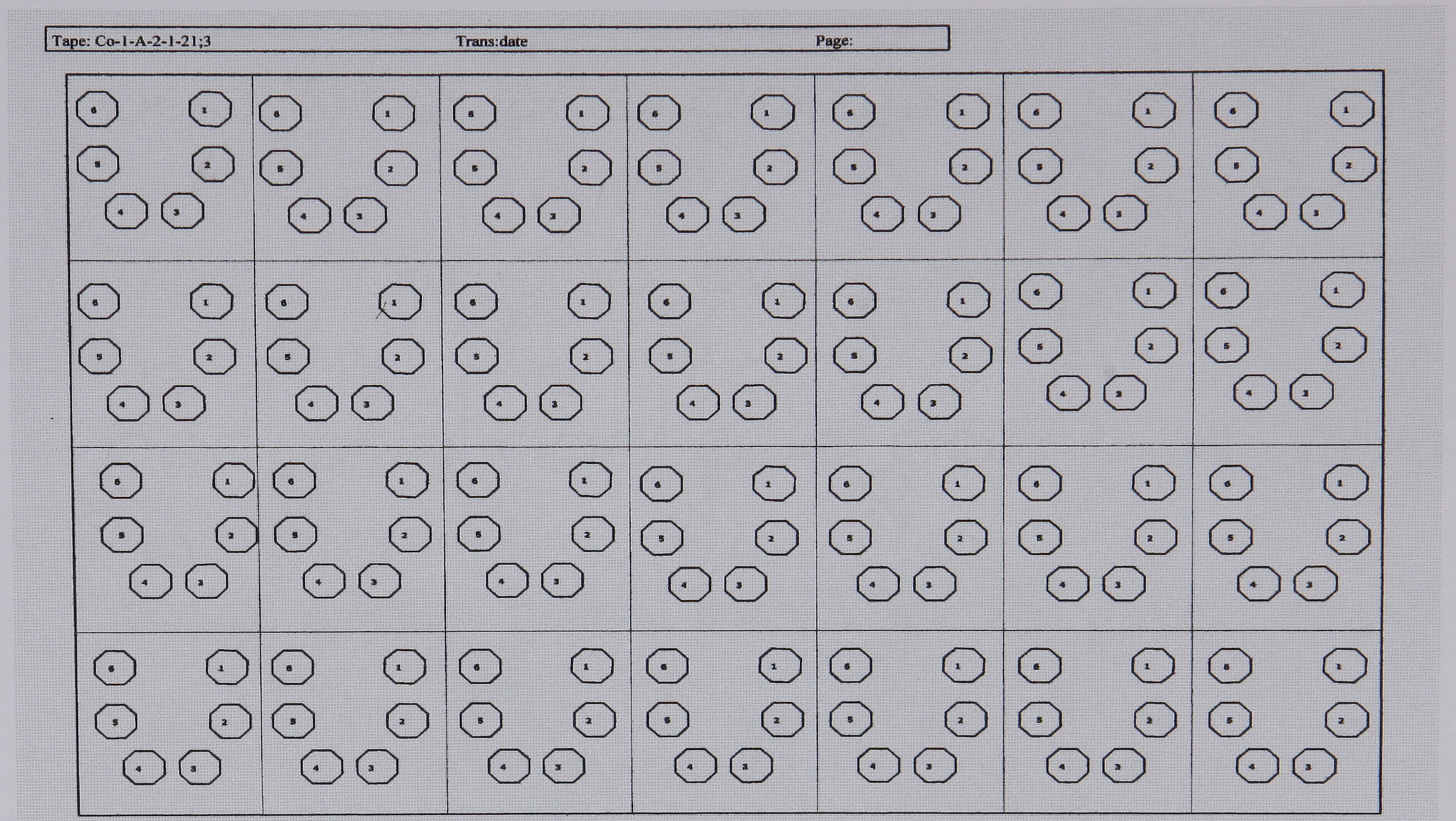
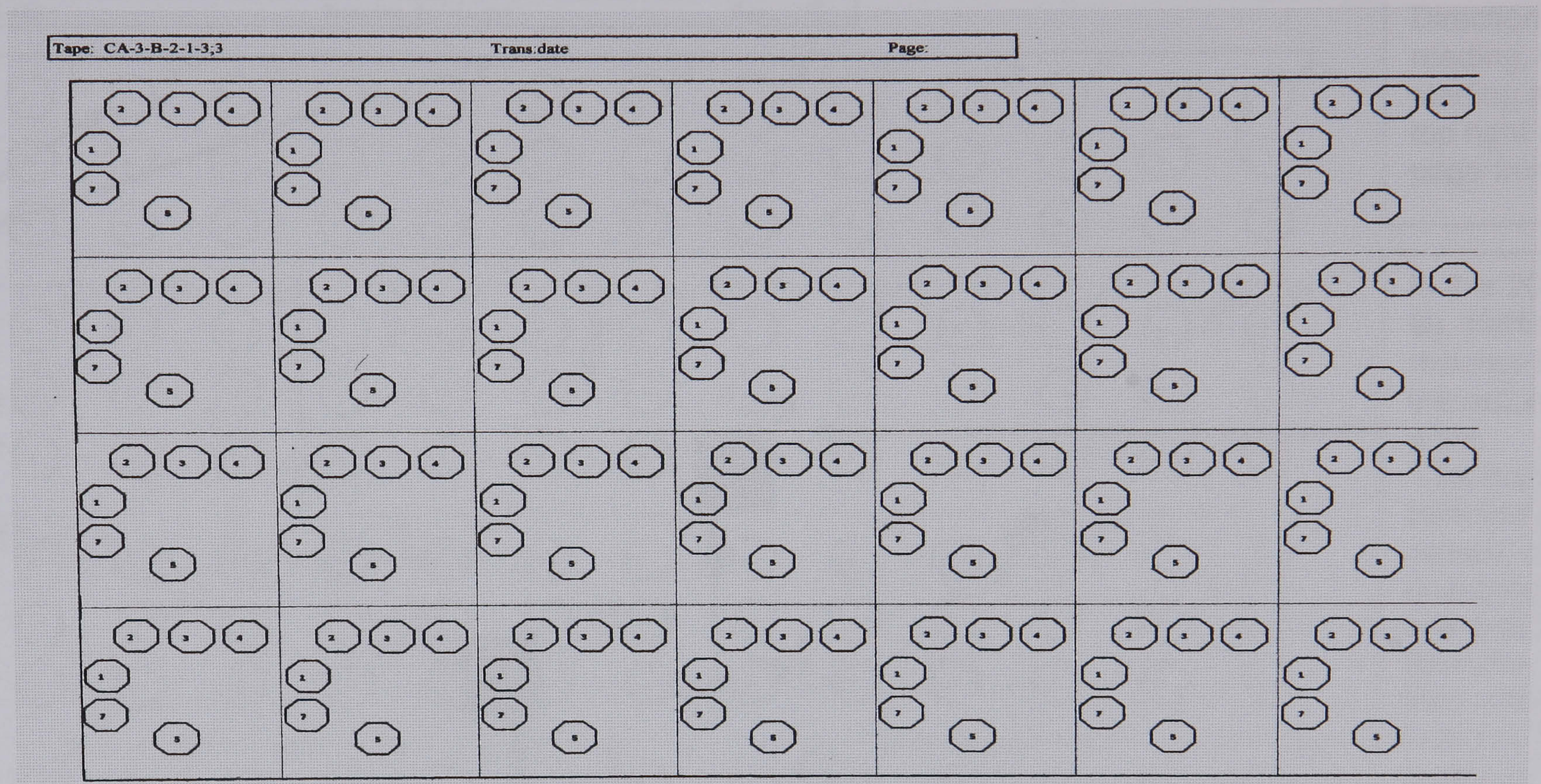
Gestures and codes			
Gesture	Code	Gesture	Code
Participant moving to floor		Participant stands	
Participant gets up		Participant sits down	
Touch upwards		Touch downwards	
Touch to left		Touch to right	
Touch to back		Touch forwards	
Touch to self		Touch to other	
Object *handed* to other		Object *received* from other	
Object handed upwards		Object handed downwards	
Object handed to left		Object handed to right	
Object handed backwards		Object handed forwards	

Fig.2.04 Example of task observation transcription record sheet for a TOG group.



Note: Each small box represented a frame. Participant activity was recorded on a per frame basis. Where events apparently occurred at the same time they were included in the same frame. Each frame showed a 'birds-eye' view of the task table. Octagons represented participants (pupils Nos. 1-6). The teacher, when present, was marked with a seven, and drawn into the frame to show her position relative to other participants). The spatial layout of octagons reflected participant arrangement around the task table. Original transcript sheet was printed at A4 size.

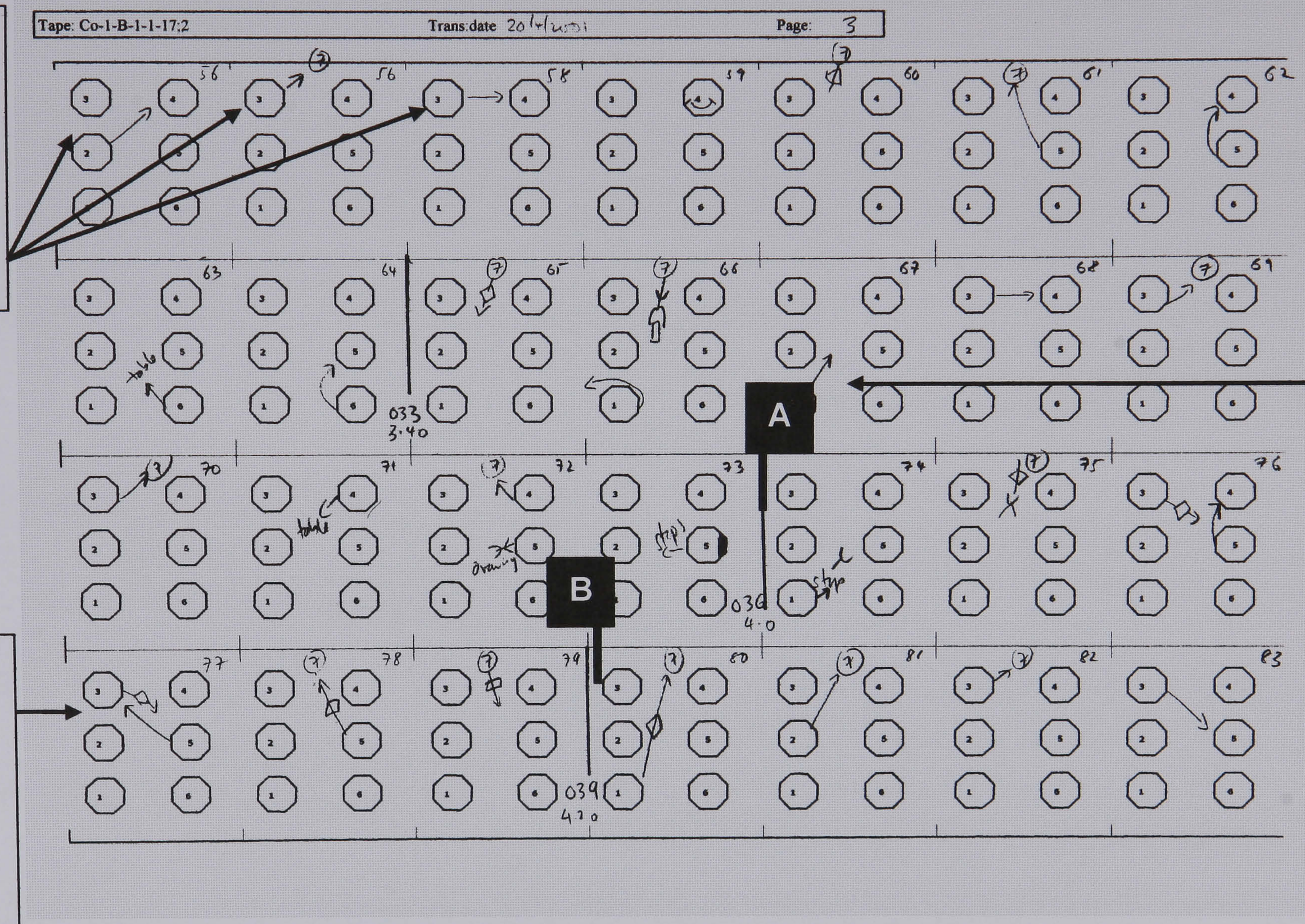
Fig.2.05 Example of task observation transcription record sheet for a TIG group.



Note: Each small box represented a frame. Participant activity was recorded on a per frame basis .Where events apparently occurred at the same time they were included in the same frame. Each frame showed a 'birds-eye' view of the task table. Octagons represented participants (pupils Nos. 1-6, teacher number 7). Spatial layout of octagons reflected participant arrangement around the task table. Original transcript sheet was printed at A4 size.

Fig.2.06 Example of a completed task observation transcription record sheet taken from a TOG group observation.

Gestures, targeting, and activity of each participant represented as symbols. Each participant reported, in turn, in successive frames



Direction of transcribing, and reading, was by rows: starting at top left, going to top right and then down the page from left to right.

In this 20 second cycle (**A** to **B**), starting at frame 74, 4.0 minutes into the observation, the recorded observations were:
1 (active), 2 (inactive), 7 (teacher arrives and is active), 3 (active), 4 (inactive), 5 (active, 3 also active at the same time), 6 (inactive, but 7 active and also noted). The cycle ended in frame 79, the next cycle began at frame 80 with 1 (active) etc.

If a participant showed no gestural, targeting, or task activity when due to be observed, the octagon was left blank.

Although 5 was being observed, the possibly linked activity of 3, occurring at the same time, and directed at 5, was also noted.

Note: Original transcript was A4 size

Appendix 3

Coding materials

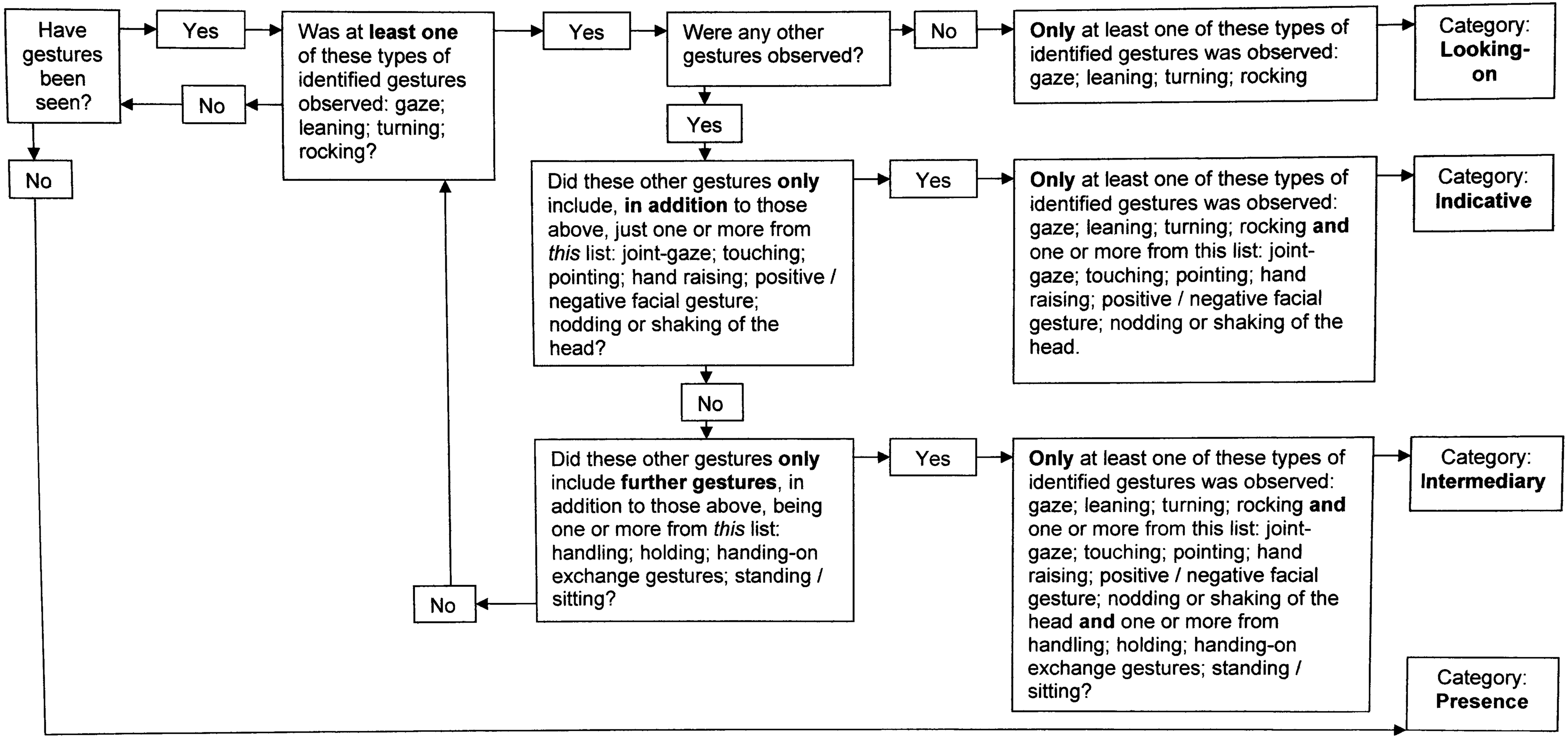


Figure 3.01 Categorisation decision tree for variable 'Gesture'.

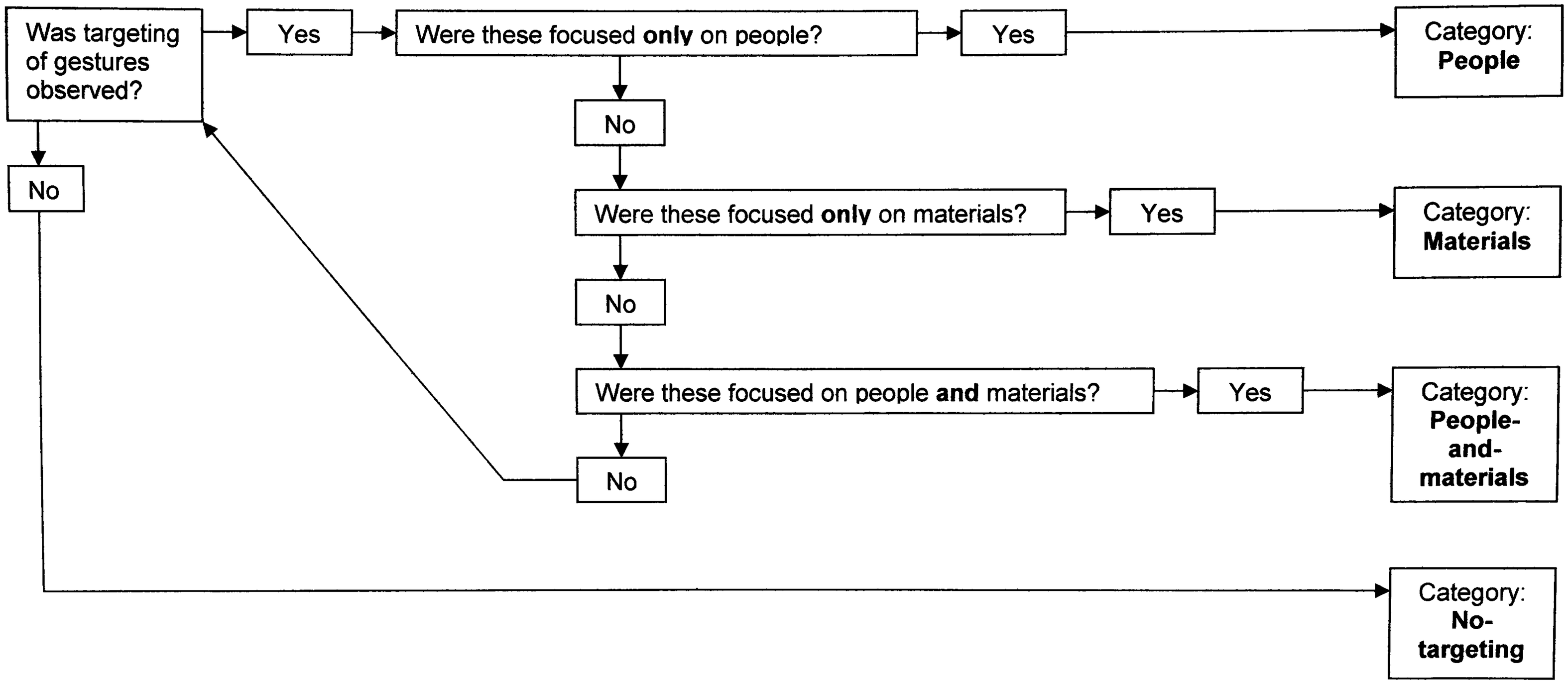


Figure 3.02 Categorisation decision tree for variable 'Gesture targeting'.

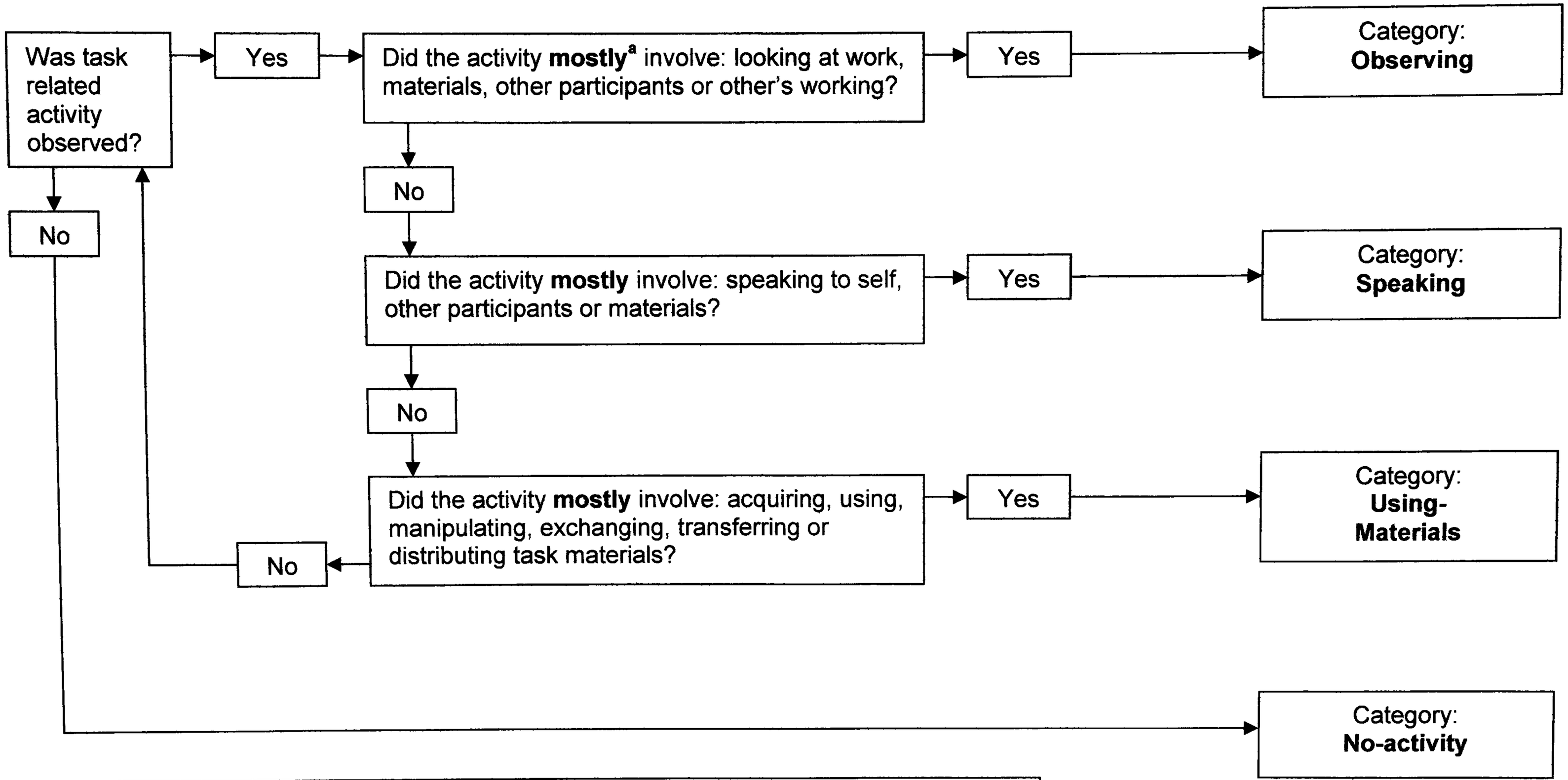


Figure 3.03. Categorisation decision tree for variable 'Task-activity'.

[a] Based on a simple counted majority of the various activities in the observation.

The inter-rating of variable categories from observation of video materials.

Five short grouped tasks, captured with a hand-held video recorder, were used to examine the feasibility of an observer capturing gestural information using the method described in the thesis. As the camera was held above and to the side of the group, members of which were leaning inwards, the categories of smiling and frowning could not be reliably captured. It was also possible that head nods and shakes could be lost in forward leaning movements as pupils crowded into the table. For the same reasons joint-gaze would have been difficult to detect. These concerns were consistent with pre-study reasons for not using video in the actual study. Accordingly a narrower range of categories were used in this inter-rating activity.

The observational method created a narrative of what was observed. This, once written down, was then analysed into categories. To be amenable to categorisation, observations would need to be placeable in exclusive categories. However, gaze, turning and leaning might co-occur in the present context. As suggested by Bakeman and Gottman (1997 p72), however, individual agreement statistics were calculated using collapsed agreement matrices by turning the coding into a yes/no dichotomy for a particular code. This approach was used to test agreement on the codes for three indicator categories: Gaze, Leaning and Turning (Table 3.01). The mean values for each are summarised in Table 3.02.

Table 3.01 Summary of κ (Cohen's Kappa)[a] values for inter-rating[b] of variables taken from video observation.

Focus	O	N	P_{obs}	P_{exp}	κ	SE	0.95 confidence interval	
							Lower limit	Upper limit
Gaze								
	1	90	0.97	0.7265	**0.8846**	0.127	0.7576	1.0116
	2	150	0.54	0.8167	**0.6018**	0.1493	0.4525	0.7511
	3	108	0.90	0.6665	**0.7080**	01386	0.5964	0.8466
	4	167	0.68	0.9341	**0.7946**	0.1160	0.6786	0.9106
	5	86	076	0.9278	**0.6994**	0.2083	0.4911	0.9072
Lean								
	1	90	0.53	0.9326	**0.8556**	0.1109	0.7447	0.9665
	2	150	0.52	0.9276	**0.8506**	0.0854	0.7652	0.9360
	3	108	0.71	0.9310	**0.7595**	0.1580	0.6015	0.9175
	4	167	0.60	0.8966	**0.7434**	0.1224	0,6210	0.8658
	5	86	0.51	0.8406	**0.6793**	0.1731	0,5062	0.8524
Turn								
	1	90	0.53	0.9451	**0.8820**	0.0999	0.7821	0.9819
	2	150	0.50	0.8820	**0.7763**	0.0999	0.6764	0.8762
	3	108	0.53	0.9182	**0.8243**	0.1091	0.7152	0.9934
	4	167	0.54	0.8278	**0.6221**	0.1315	0.4906	0.7536
	5	86	0.64	0.9220	**0.7522**	0.7142	0.5780	0.9264

Note: [a] = Cohen's Kappa: calculation as described in Bakeman and Gottman (1997) (2nd Edition) p56-80 and confirmed by reference to http://faculty.vassar.edu/lowry/kappaexp.html 16-01-2004 2.30pm GMT; [b] = Inter-rating between: K .R. Wall and A. Earle

O = Video observation; N=Number of observations sampled for Kappa calculation; P_{obs}= Proportion of agreement actually observed; P_{exp}= proportion of agreement expected by chance; ê = Cohen's Kappa; SE= Standard error.

Table 3.02 Summary of arithmetic mean Kappa for each focus.

Variable	**Mean Kappa**
Gaze	0.74
Lean	0.78
Turn	0.77

Inter-rating of coding for observational categories from transcripts.

Six of the task observation gestural transcripts were chosen by random number generator. The same 100 observations were independently coded from each task using the decision trees for each observational variable (see earlier).Cohen's Kappa was calculated for each. Results are shown in Table 3.03. The mean values for each observational variable are shown in Table 3.04.

Table 3.03 Summary of κ (Cohen's Kappa)[a] values for inter-rating[b] of variables taken from task transcripts.

Variable	T	N	P_{obs}	P_{exp}	κ	SE	0.95 confidence interval	
							Lower limit	Upper limit
Gesture								
	3	100	0.91	0.2915	**0.8730**	0.0784	0.7946	0.9514
	28	100	0.85	0.4255	**0.7389**	0.1176	0.6213	0.8565
	9	100	0.90	0.3548	**0.8450**	0.0898	0.7552	0.9348
	34	100	0.87	0.2844	**0.8138**	0.0919	0.7264	0.9102
	36	100	0.83	0.2958	**0.7586**	0.1037	0.6549	0.8623
	13	100	0.87	0.3532	**0.7990**	0.0980	0.7010	0.8970
Gesture target								
	3	100	0.82	0.2705	**0.7533**	0.1018	0.6515	0.8551
	28	100	0.81	0.2645	**0.7417**	0.1018	0.6399	0.8435
	9	100	0.81	0.2662	**0.7411**	0.1037	0.6374	0.8448
	34	100	0.83	0.2865	**0.7617**	0.1018	0.6599	0.8635
	36	100	0.81	0.2691	**0.7400**	0.1018	0.6382	0.8418
	13	100	0.86	0.3280	**0.7916**	0.0098	0.6937	0.8897
Task activity								
	3	100	0.88	0.2604	**0.8378**	0.0854	0.7524	0.9232
	28	100	0.92	0.8787	**0.8787**	0.0808	0.7979	0.9595
	9	100	0.81	0.2799	**0.7361**	0.1055	0.6306	0.8416
	34	100	0.94	0.2999	**0.9143**	0.0679	0.8464	0.9822
	36	100	0.92	0.3382	**0.8791**	0.0808	0.7983	0.9599
	13	100	0.83	0.3396	**0.7425**	0.1074	0.6352	0.8500

Note: [a] = Cohen's Kappa: calculation as described in Bakeman and Gottman (1997) (2nd Edition) p56-80 and confirmed by reference to http://faculty.vassar.edu/lowry/kappaexp.html 16-01-2004 2.30pm GMT; [b] = inter-rating between: K .R. Wall and A. Earle.

T=Task number of sampled observation; N=Number of observations sampled for Kappa calculation; P_{obs}= Proportion of agreement actually observed; P_{exp}= proportion of agreement expected by chance; ê = Cohen's Kappa; SE= Standard error.

Table 3.04 Summary of arithmetic mean Kappa for each variable.

Variable	Mean Kappa
Gesture-use	0.81
Gesture-targets	0.76
Task-activity	0.83

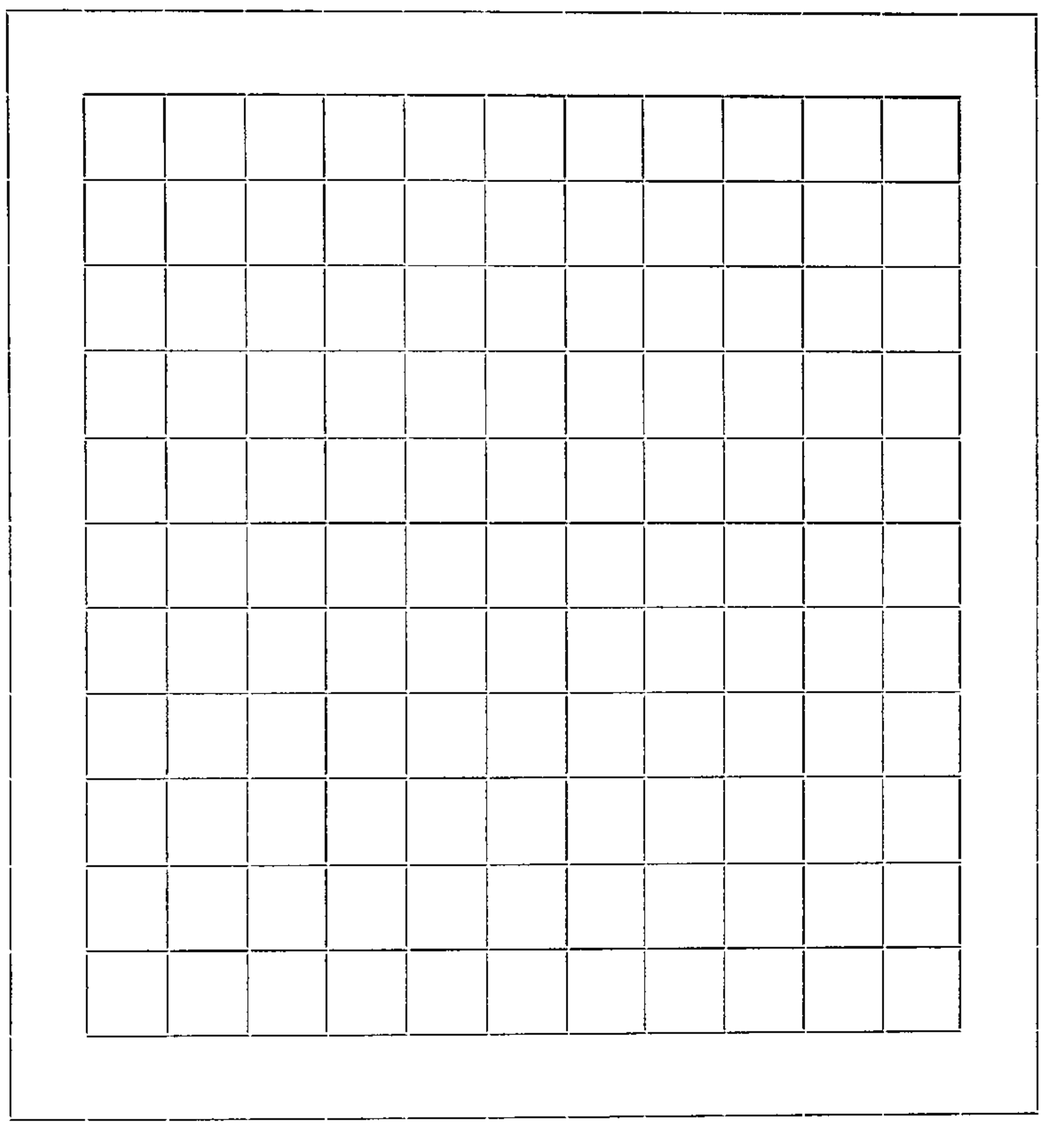
Appendix 4

Observation grids

Figure 4.01 Observation grids: room layout.

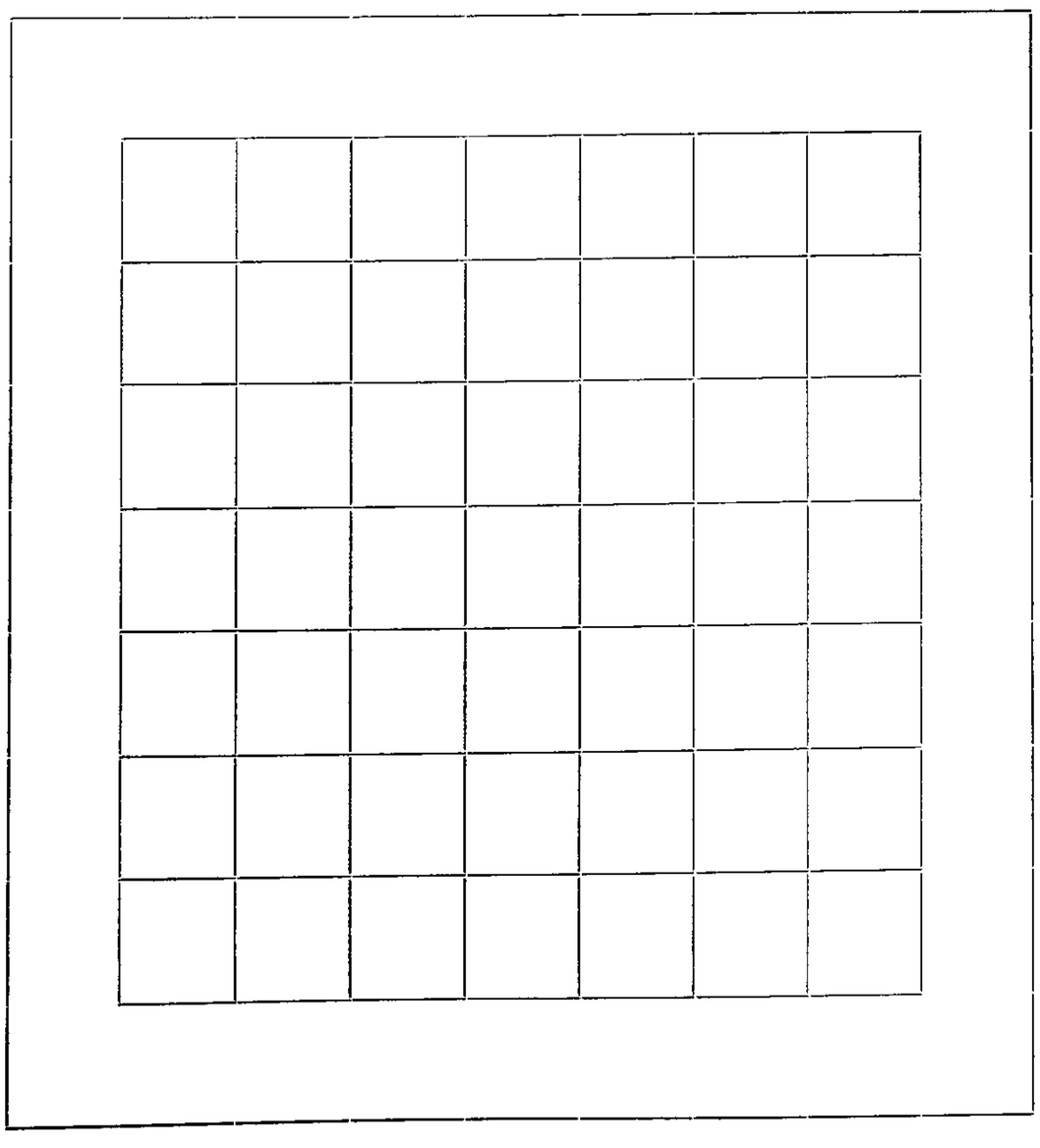
Observation schedule - Room lay out	
Date /	
School	
Teacher	
Class	

Cod



Room layout

Notes



Carpet time layout

Notes

Figure 4.02 Observation grids: table layout and group members.

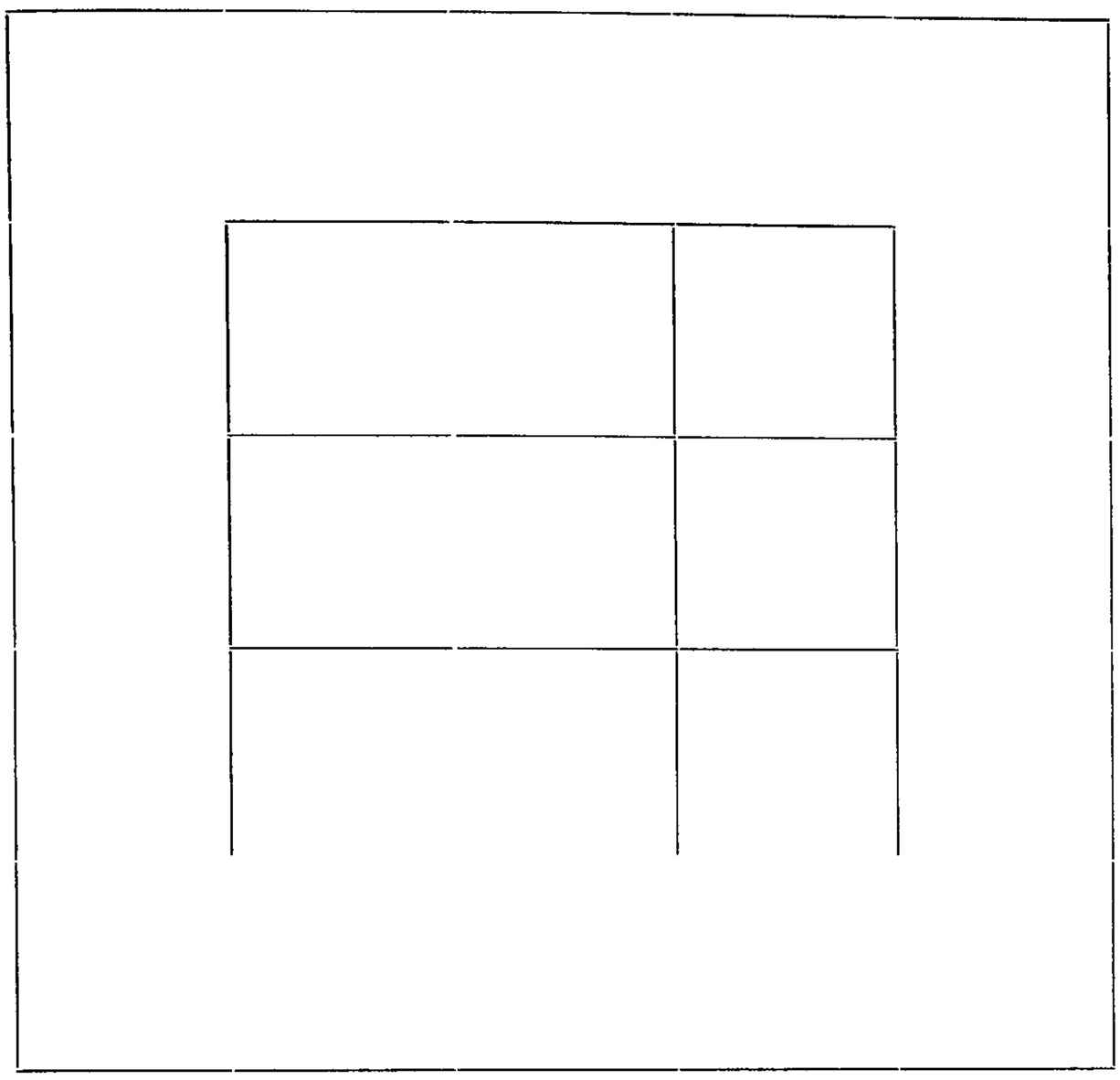


Table layout

Notes

Key

1-6	Pupil observation number and position
7	Teacher observation number and position
8	Observer number and position
M	Desk microphone position

Position number	Person name	Project code
School		
1		
2		
3		
4		
5		
6		
7		

Notes

Appendix 5

Teacher interview script

Teacher interview script

Step	Question (+ prompts+ probes)
1	Hello...X...thank you for agreeing to be interviewed. The focus of the interview is about pupil and teacher interaction in group work. What we discuss is confidential and may only be seen, unidentified, by my supervisor. May I quote from it , without identifying you, in my final account of the research? May I tape record this interview? **YES** - Would you like a transcript of this interview ? Do you want to comment on it to make any changes before I make it part of my research materials? **No** - May I make notes of what is said , and agree them with you as a record of our interview?
2	Start Tape or make notes
3	These questions are about your teaching background: Q1) Where did you do your teaching qualification? Q2 What was it (P-PGCE, BEd etc) Q3) When did you achieve QTS? Q4) How long have you been teaching? Q5) How many schools have you taught in? Q6) Which age groups do you normally teach? Q7) Why did you choose this particlar age group when you started teaching? Q8) Why did you choose to work in an inner city area? Q9) Does your school have a policy on pupil grouping to be used by all staff? (pr- Can you give me a brief idea of what it says?)
4	This questions are about pupil grouping in the classroom: I have noticed that you use a variety of groupings in your classroom. Q11) What sort of work on pupil grouping did you do in your .....X....training course? Q12) ... and in your teaching practice...? Q13) ...and in your first year of teaching...? Q14) ...and in any professional development since then ? Q15) What sort of pupil groupings do you use in your classroom? Q16)... Why these particular types? Q17)... To what extent do you use them each week? Q18)... How do you decide on the composition of a particular group?

Teacher Interview script. Contd

Step	Question (+ prompts [p] + probes [pr])
	Subsequent questions follow same structure, unless shown as otherwise.Stem is given.
5	These questions are about **pupil group work.** (p- how the work is structured within the group): Q19) How do you organise work within a particular group?
6	These questions are about **the teacher's role in pupil group work:** (p - how you interact with the group when you are working with them) Q20) What do you think the teachers role in pupil group work is? Q21) How do you manage this in your classroom? Q22) How does it relate to the type of group work being done?
7	These questions are about **teacher's use of language with pupils** (p - the type of talk you use with your children): Q23) Do you deliberately use particular types of language with the children when you are talking to them? Q24) Why is this? Q25) Can you give some examples? Q26) Do you use emphasis and pause in your talk with your children? Q27) Why is this? Q28) Can you give some examples? Q29) How does what you say affect children's learning?
8	These questions are about **teacher's use of facial gestures** (p - expression etc.): Q30) Do you deliberately use particular types of facial gesture with the children when you are talking to them? Q31) Why is this? Q32) Can you give some examples?
9	These questions are about **teacher's use of body language** (p - using your hands, gestures etc.): Q24) Do you deliberately use particular types of body language with the children when you are talking to them? Q25)Why is this? Q26) Can you give some examples? Q27) How do the expressions you use and your body language affect your childrens learning?

Step	Question (+ prompts [p] + probes [pr])
10	These questions are about **pupils' use of facial gestures** (p-expression etc.): Q28)To what extent are you aware of childrens facial gestures? Q29) Do you use this awareness to interpret their behaviour?
11	These questions are about **pupils' use body language** (p-using hands, gestures etc.): Q30) To what extent are you aware of childrens body language? Q31) Do you use this awareness to interpret their behaviour?
12	These questions are about **pupil cognitive development** (p - develpment of thinking and reasoning skills): Q32) How aware do you feel you are about these skills?
13	These questions are about **strategies for developing pupils' cognitive skills:** Q33) What strategies do you use to develop this in your children? Q33) Are there any constraints on how you do it?
14	Lastly can I show you one of the activites I have used with the children to get your response and comments? > Faces activity
15	Thank you for your time and detailed answers and the priviledge of allowing me to observe you in your practice with your children: Q34) Do you have any questions or comments you want to make? Here are my contact details. I will get the transcription Notes to you as soon as possible. Q34) Shall I contact you via school? Thank you

Appendix 6

Two-way, between-groups, independent ANOVA calculations and data: *post hoc* results

Table 6.01 Results of *post hoc* tests for 2-way, between-groups, Independent ANOVA: main effect: Participants; TOG Gestures.

Gesture	Participant type 1st (13)	Participant type 2nd (13)	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Presence	g	b	2.69	1.000	-11.10	16.49
	g	t	-47.46	**<0.0005** [t > g]	-61.26	-33.66
	b	t	-50.15	**<0.0005** [t > b]	-63.95	-36.36
Looking-on	g	b	-0.69	1.000	-13.92	12.53
	g	t	22.69	**<0.0005** [g > t]	9.47	35.92
	b	t	23.38	**<0.0005** [b > t]	10.16	36.61
Indicative	g	b	-2.00	0.968	-7.02	3.02
	g	t	2.85	0.487	-2.18	7.87
	b	t	4.85	0.062	-0.18	9.87
Intermediary	g	b	0.38	1.000	-9.19	9.96
	g	t	22.46	**<0.0005** [g > t]	12.89	32.04
	b	t	22.08	**<0.0005** [b > t]	12.50	31.65

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = all *p* values given as exact values, statistically significant values in bold type. The balance of means is given using participant categories, largest mean first. All tests: Bonferroni.

Table 6.02 Results of *post hoc* tests for 2-way, between-groups, Independent ANOVA: main effect: Participants; TOG Gesture-Targeting.

Gesture	Participant type 1st (13)	Participant type 2nd (13)	Mean Diff.	Sig. [a]	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
No-targeting	g	b	2.54	1.000	-11.62	16.70
	g	t	-48.23	**<0.0005** [t > g]	-62.39	-34.07
	b	t	-50.77	**<0.0005** [t > b]	-64.93	-36.61
People	g	b	-1.23	1.000	-10.97	8.50
	g	t	10.46	**0.032** [g > t]	0.73	20.20
	b	t	11.69	**0.014** [b > t]	1.96	21.43
Materials	g	b	-0.77	0.967	-8.64	7.10
	g	t	17.85	***<0.0005*** [g > t] [b]	11.02	24.67
	b	t	18.62	***<0.0005*** [b > t] [b]	13.22	24.01
People and Materials	g	b	-0.23	1.000	-7.64	7.18
	g	t	19.62	**<0.0005** [g > t]	12.21	27.02
	b	t	19.85	**<0.0005** [b > t]	12.44	27.25

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = all *p* values given as exact values, statistically significant values in bold type. The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate the related ANOVA failed Levene's test. Bonferroni test used unless otherwise indicated. [b] = Games-Howell test used as variance was non-homogeneous.

Table 6.03 Results of *post hoc* tests for 2-way, between-groups, Independent ANOVA: main effect: Participants; TOG Task-Activity.

Task activity	Participant type 1st (13)	Participant type 2nd (13)	Mean Diff.	Sig. [a]	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
No-activity	g	b	0.08	1.000	-13.85	14.01
	g	t	-50.77	**<0.0005** [t > g]	-64.70	36.84
	b	t	-50.85	**<0.0005** [t > b]	-64.78	36.91
Observing	g	b	4.62	0.692$_b$	-18.89	9.66
	g	t	21.08	***<0.0005*** [g > t]$_b$	13.52	28.63
	b	t	25.69	***0.001*** [b > t]$_b$	11.96	39.42
Speaking	g	b	-0.62	1.000	-8.67	7.44
	g	t	0.00	1.000	-8.06	8.06
	b	t	0.62	1.000	-7.44	8.67
Using – materials	g	b	4.15	0.517	-3.35	11.66
	g	t	28.85	**<0.0005** [g > t]	21.34	36.35
	b	t	24.69	**<0.0005** [b > t]	17.18	32.20

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = all *p* values given as exact values, statistically significant values in bold type. The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate the related ANOVA failed Levene's test. Bonferroni test used unless otherwise indicated. $_b$ = Games-Howell test used as variance was non-homogeneous.

Table 6.04 Results of *post hoc* tests for 2-way, between-groups, Independent ANOVA: main effect: Participants; TIG Gestures.

Gesture	Participant type		Mean Diff.	Sig[a]	95% Confidence Interval	
	1st	2nd			Lower Bound	Upper Bound
Presence	g[b] (12)	b (8)	4.29	0.603	-5.41	14.00
	g[c] (12)	t (12)	6.58	0.194	-2.15	15.32
	b[b] (8)	t (12)	2.29	0.907	-7.41	12.00
Looking-on	g[b]	b	5.25	0.639	-7.22	17.72
	g[c]	t	-16.83	**0.002** [t > b]	-28.05	5.61
	b[b]	t	-22.08	**<0.0005** [t > b]	-34.55	-9.61
Indicative	g[b]	b	-4.46	0.342	-11.78	2.87
	g[c]	t	9.67	**0.003** [g > t]	3.08	16.26
	b[b]	t	14.13	**<0.0005** [b > t]	6.80	21.45
Intermediary	g[b]	b	-4.96	0.276	-12.46	2.54
	g[c]	t	6.13	0.143	-1.42	13.67
	b[b]	t	6.13	0.134	-1.37	13.62

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = all *p* values given as exact values, statistically significant values in bold type. The balance of means is given using participant categories, largest mean first. [b] = Unequal sample sizes; Hochberg's GT2 test used. [c] = Equal sample sizes; Bonferroni test used.

Table 6.05 Results of *post hoc* tests for 2-way, between-groups, Independent ANOVA: main effect: Participants; TIG Gesture-Targeting.

Gesture	Participant type		Mean Diff.	Sig[a]	95% Confidence Interval	
	1st	2nd			Lower Bound	Upper Bound
No-targeting	g[b] (12)	b (8)	5.00	0.482	-4.72	14.72
	g[c] (12)	t (12)	6.67	0.186	-2.08	15.41
	b[b] (8)	t (12)	1.67	0.961	-8.05	11.38
People	g[b]	b	-1.54	0.957	-10.25	7.17
	g[c]	t	-29.67	**<0.0005** [t > b]	-37.50	21.83
	b[b]	t	-28.12	**<0.0005** [t > b]	-36.84	-19.41
Materials	g[b]	b	1.29	0.900	-4.04	6.63
	g[c]	t	18.50	**<0.0005** [g > t]	13.70	23.30
	b[b]	t	17.21	**<0.0005** [b > t]	11.87	22.54
People and Materials	g[b]	b	-3.88	0.518	-11.74	3.99
	g[c]	t	5.17	0.219	-1.91	12.24
	b[b]	t	9.04	**0.021** [b > t]	-1.18	16.90

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = all *p* values given as exact values, statistically significant values in bold type. The balance of means is given using participant categories, largest mean first. Where Levene's test was failed, values are in italic type and the Games-Howells procedure was used, otherwise: [b] = Unequal sample sizes; Hochberg's GT2 test used. [c] = Equal sample sizes; Bonferroni test used.

Table 6.06 Results of *post hoc* tests for 2-way, between-groups, Independent ANOVA: main effect: Participants: TIG Task-Activity.

Gesture	Participant type		Mean Diff.	Sig[a]	95% Confidence Interval	
	1st	2nd			Lower Bound	Upper Bound
No-activity	g[b] (12)	b (8)	4.96	0.451	-4.32	14.23
	g[c] (12)	t (12)	7.00	0.124	-1.34	15.34
	b[b] (8)	t (12)	2.04	0.923	-7.23	11.32
Observing	g[b]	b	4.33	0.621	-5.71	14.38
	g[c]	t	42.00	**<0.0005** [g > t]	-32.96	51.04
	b[b]	t	37.67	**<0.0005** [b > t]	27.62	47.71
Speaking	g[b]	b	-4.63	0.618	-15.29	6.04
	g[c]	t	-53.17	**<0.0005** [t > g]	-62.76	-43.57
	b[b]	t	-48.54	**<0.0005** [t > b]	-59.21	-37.87
Using - materials	g[b]	b	-3.38	0.388	-9.24	2.49
	g	t	4.92	***0.027*** [g > t]	0.52	9.32
	*b[b]	t	8.29	***0.004*** [b > t]	2.43	14.50
	b	t	8.29	***0.030*** [b > t]	0.89	15.69

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = all *p* values given as exact values, statistically significant values in bold type. The balance of means is given using participant categories, largest mean first. Levene's test just failed ($p = 0.046$), values are in italic type and the Games-Howells procedure was used, otherwise: [b] = Unequal sample sizes; Hochberg's GT2 test used. [c] = Equal sample sizes; Bonferroni test used. * Both test results given, as there was a large difference in apparent significance levels.

Appendix 7

Correlation related data

Table 7.01 Pearson's *r* correlations - data: Looking-on gestures X Gesture-targeting (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Looking-on X Targeting-to-People						
Pearson correlation	0.689	0.565	0.786	0.349	0.337	0.733
Sig. (2-tailed)	0.009	0.044	0.001	0.266	0.415	0.007
Sig. after Bonferroni correction	<0.020	n	<0.003	n	n	<0.020
Looking-on X Targeting-to-Materials						
Pearson correlation	0.456	0.598	0.200	0.726	0.726	-0.053
Sig. (2-tailed)	0.117	0.031	0.511	0.007	0.041	0.869
Sig. after Bonferroni correction	n	n	n	<0.020	n	n
Looking-on X Targeting-to-People-and-materials						
Pearson correlation	0.202	-0.300	0.243	-0.075	0.143	-0.008
Sig. (2-tailed)	0.509	0.320	0.423	0.818	0.735	0.980
Sig. after Bonferroni correction	n	n	n	n	n	n

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.02 Pearson's *r* correlations - data: Indicative gestures X Gesture-targeting (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Indicative X Targeting-to-People						
Pearson correlation	-0.359	-0.113	0.459	0.392	0.657	0.263
Sig. (2-tailed)	0.229	0.713	0.115	0.207	0.077	0.408
Sig. after Bonferroni correction	n	n	n	n	n	n
Indicative X Targeting-to-Materials						
Pearson correlation	-0.072	-0.159	-0.077	0.058	0.010	-0.088
Sig. (2-tailed)	0.816	0.604	0.803	0.859	0.980	0.786
Sig. after Bonferroni correction	n	n	n	n	n	n
Indicative X Targeting-to-People-and-materials						
Pearson correlation	0.237	0.611	0.063	0.448	0.661	-0.088
Sig. (2-tailed)	0.436	0.027	0.838	0.145	0.074	0.785
Sig. after Bonferroni correction	n	n	n	n	n	n

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.03 Pearson's *r* correlations - data: Intermediary gestures X Gesture-targeting (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Intermediary X Targeting-to-People						
Pearson correlation	0.020	-0.118	0.477	-0.156	-0.268	-0.884
Sig. (2-tailed)	0.949	0.702	0.100	0.628	0.520	<0.0005
Sig. after Bonferroni correction	n	n	n	n	n	<0.003
Intermediary X Targeting-to-Materials						
Pearson correlation	-0.099	-0.018	0.320	-0.344	-0.744	0.478
Sig. (2-tailed)	0.749	0.954	0.286	0.274	0.034	0.116
Sig. after Bonferroni correction	n	n	n	n	n	n
Intermediary X Targeting-to-People-and-materials						
Pearson correlation	0.074	0.358	0.942	0.244	0.359	0.602
Sig. (2-tailed)	0.809	0.230	<0.0005	0.445	0.383	0.038
Sig. after Bonferroni correction	n	n	<0.003	n	n	n

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.04 Pearson's *r* correlations - data: Looking-on gestures X Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Looking-on X Observing						
Pearson correlation	0.762	0.732	0340	0.713	0.930	-0.331
Sig. (2-tailed)	0.002	0.004	0.255	0.001	0.001	0.294
Sig. after Bonferroni correction	<0.003	<0.02	n	<0.003	<0.003	n
Looking-on X Speaking						
Pearson correlation	0.159	-0.551	0.721	-0.575	-0.035	0.896
Sig. (2-tailed)	0.605	0.051	0.005	0.050	0.934	<0.0005
Sig. after Bonferroni correction	n	n	<0.02	n	n	<0.003
Looking-on X Using-materials						
Pearson correlation	0.693	-0.238	-0.036	-0.304	-0.284	-0.715
Sig. (2-tailed)	0.009	0.434	0.907	0.336	0.496	0.009
Sig. after Bonferroni correction	<0.02	n	n	n	n	<0.02

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.05 Pearson's *r* correlations - data: Indicative gestures X Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Indicative X Observing						
Pearson correlation	-0.534	-0.315	0.650	0.475	0.492	0.492
Sig. (2-tailed)	0.060	0.294	0.016	0.119	0.216	0.104
Sig. after Bonferroni correction	n	n	<0.02	n	n	n
Indicative X Speaking						
Pearson correlation	0.097	0.398	0.193	0.195	0.423	-0.068
Sig. (2-tailed)	0.751	0.178	0.527	0.544	0.297	0.833
Sig. after Bonferroni correction	n	n	n	n	n	n
Indicative X Using-materials						
Pearson correlation	0.140	0.621	-0.159	-0.332	0.099	0.188
Sig. (2-tailed)	0.647	0.024	0.605	0.292	0.815	0.558
Sig. after Bonferroni correction	n	n	n	n	n	n

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.06 Pearson's *r* correlations - data: Intermediary gestures X Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Intermediary X Observing						
Pearson correlation	-0.062	-0.150	0.091	-0.541	-0.767	-0.151
Sig. (2-tailed)	0.840	0.626	0.767	0.069	0.026	0.640
Sig. after Bonferroni correction	n	n	n	n	n	n
Intermediary X Speaking						
Pearson correlation	0.307	0.138	0.731	0.176	0.232	-0.450
Sig. (2-tailed)	0.308	0.653	0.004	0.584	0.580	0.142
Sig. after Bonferroni correction	n	n	<0.02	n	n	n
Intermediary X Using-materials						
Pearson correlation	-0.525	0.313	0.567	0.823	0.556	0.827
Sig. (2-tailed)	0.066	0.298	0.043	0.001	0.153	0.001
Sig. after Bonferroni correction	n	n	n	<0.003	n	<0.003

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.07 Pearson's *r* correlations - data: Targeting-to-People X Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Targeting-to-People X Observing						
Pearson correlation	0.789	0.883	0.576	0.376	0.193	-0.014
Sig. (2-tailed)	0.001	<0.0005	0.039	0.228	0.647	0.965
Sig. after Bonferroni correction	<0.003	<0.003	n	n	n	n
Targeting-to-People X Speaking						
Pearson correlation	0.114	-0.510	0.780	-0.139	0.003	0.623
Sig. (2-tailed)	0.711	0.075	0.002	0.666	0.994	0.030
Sig. after Bonferroni correction	n	n	<0.003	n	n	n
Targeting-to-People X Using-materials						
Pearson correlation	0.184	-0.480	-0.101	0.226	0.400	-0.814
Sig. (2-tailed)	0.547	0.097	0.743	0.480	0.326	0.001
Sig. after Bonferroni correction	n	n	n	n	n	<0.003

Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.02 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.08 Pearson's *r* correlations - data: Targeting-to-Materials X Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Targeting-to-Materials X Observing						
Pearson correlation	0.314	0.681	0.002	0.796	0.830	-0.019
Sig. (2-tailed)	0.297	0.010	0.994	0.002	0.011	0.954
Sig. after Bonferroni correction	n	<0.02	n	<0.003	0.02	n
Targeting-to-Materials X Speaking						
Pearson correlation	0.283	-0.549	0.198	-0.761	-0.476	0.067
Sig. (2-tailed)	0.349	0.052	0.517	0.004	0.233	0.837
Sig. after Bonferroni correction	n	n	n	<0.02	n	n
Targeting-to-Materials X Using-materials						
Pearson correlation	0.677	-0.003	0.749	-0.160	-0.454	0.349
Sig. (2-tailed)	0.011	0.991	0.003	0.619	0.258	0.266
Sig. after Bonferroni correction	<0.02	n	<0.02	n	n	n

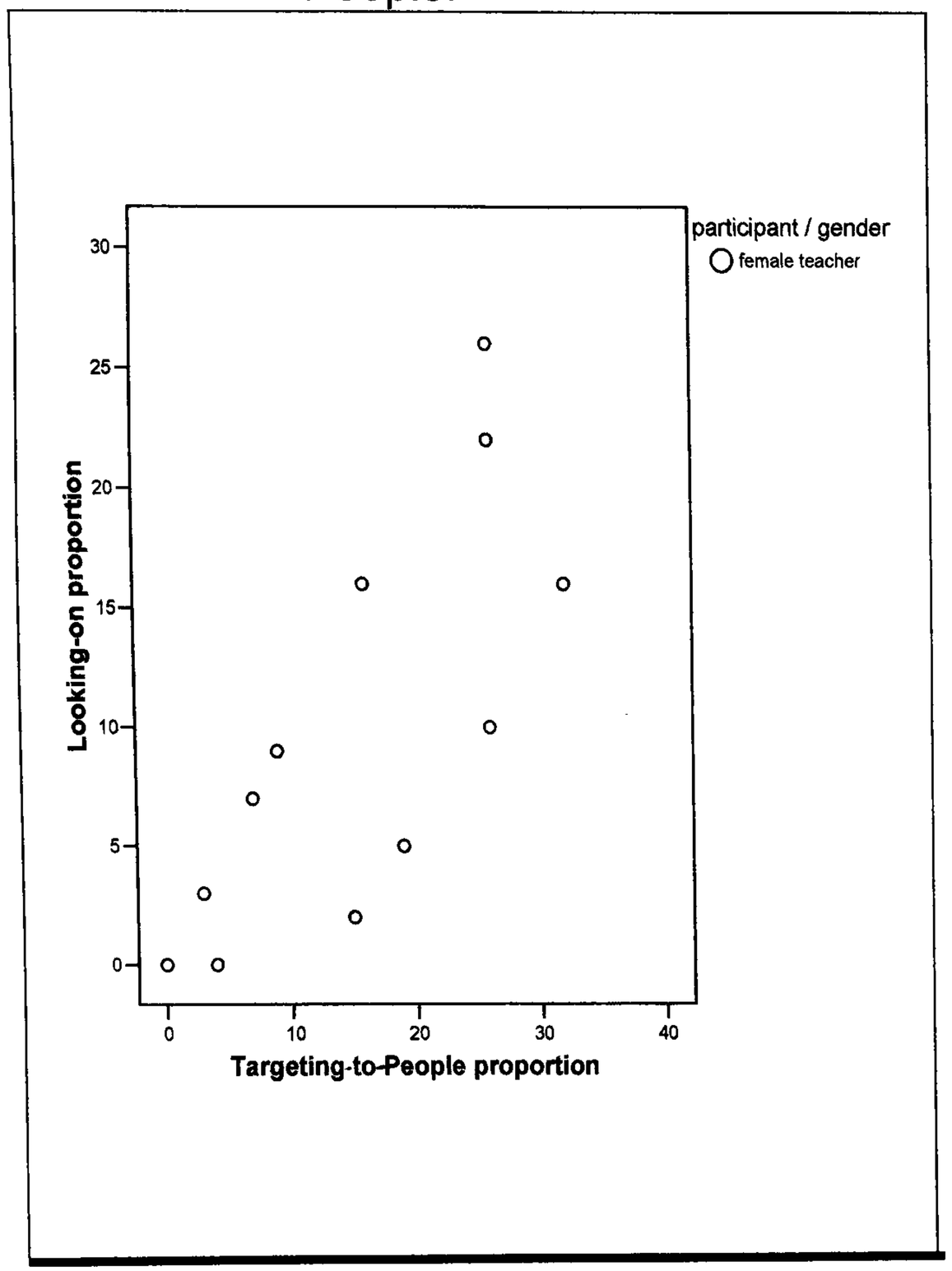
Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.020 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Table 7.09 Pearson's *r* correlations - data: Targeting-to-People-and-materials X Task-activity (Bonferroni correction applied) in the TOG and TIG settings.

	Setting					
	TOG			TIG		
Correlation Test	Girls N = 13	Boys N = 13	Teachers N = 13	Girls N = 12	Boys N = 8	Teachers N = 12
Targeting-to-People-and-materials X Observing						
Pearson correlation	0.191	-0.436	-0.010	0.176	0.036	-0.373
Sig. (2-tailed)	0.532	0.136	.975	0.858	0.932	0.233
Sig. after Bonferroni correction	n	n	n	n	n	n
Targeting-to-People-and-materials X Speaking						
Pearson correlation	0.284	0.460	0.783	0.307	0.715	0.216
Sig. (2-tailed)	0.347	0.114	0.002	0.332	0.046	0.499
Sig. after Bonferroni correction	n	n	<0.003	n	n	n
Targeting-to-People-and-materials X Using-materials						
Pearson correlation	0.094	0.795	0.538	-0.038	0.279	0.596
Sig. (2-tailed)	0.759	0.001	0.058	0.907	0.503	0.041
Sig. after Bonferroni correction	n	<0.003	n	n	n	n

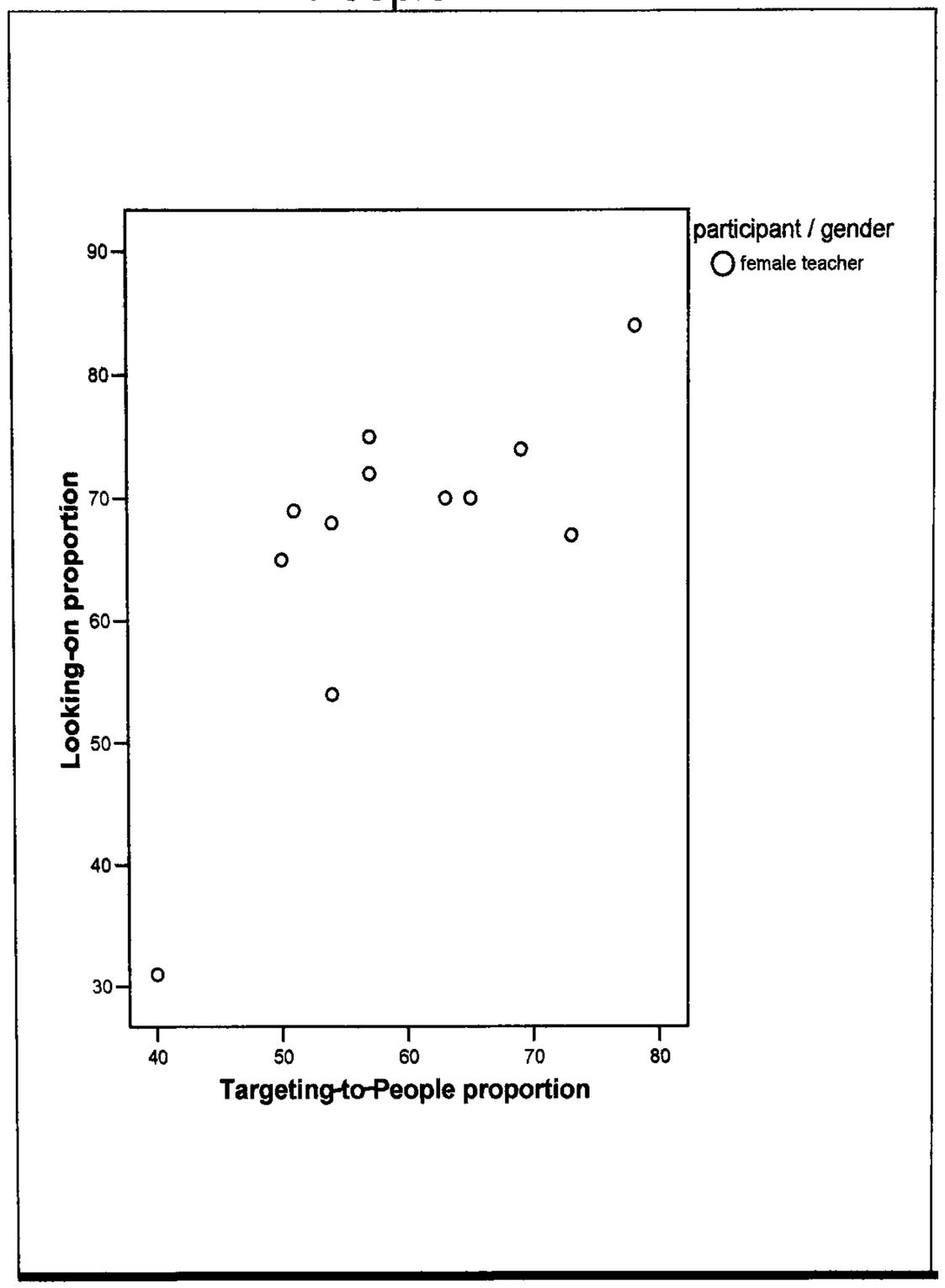
Note: Bonferroni correction: Each variable category was used three times in a particular set of test comparisons. Taking α at 0.05, the revised significance cut-off would be 0.05 / 3 = 0.02. Accordingly, a result was considered significant if it was less than 0.020 and *not* 0.05. For an α of 0.01, *p* values were considered significant below 0.01 / 3 = 0.003. 'n' = result not significant.

Figure 7.01 Scatterplot for TOG teachers: Looking-on X Targeting-to-People.



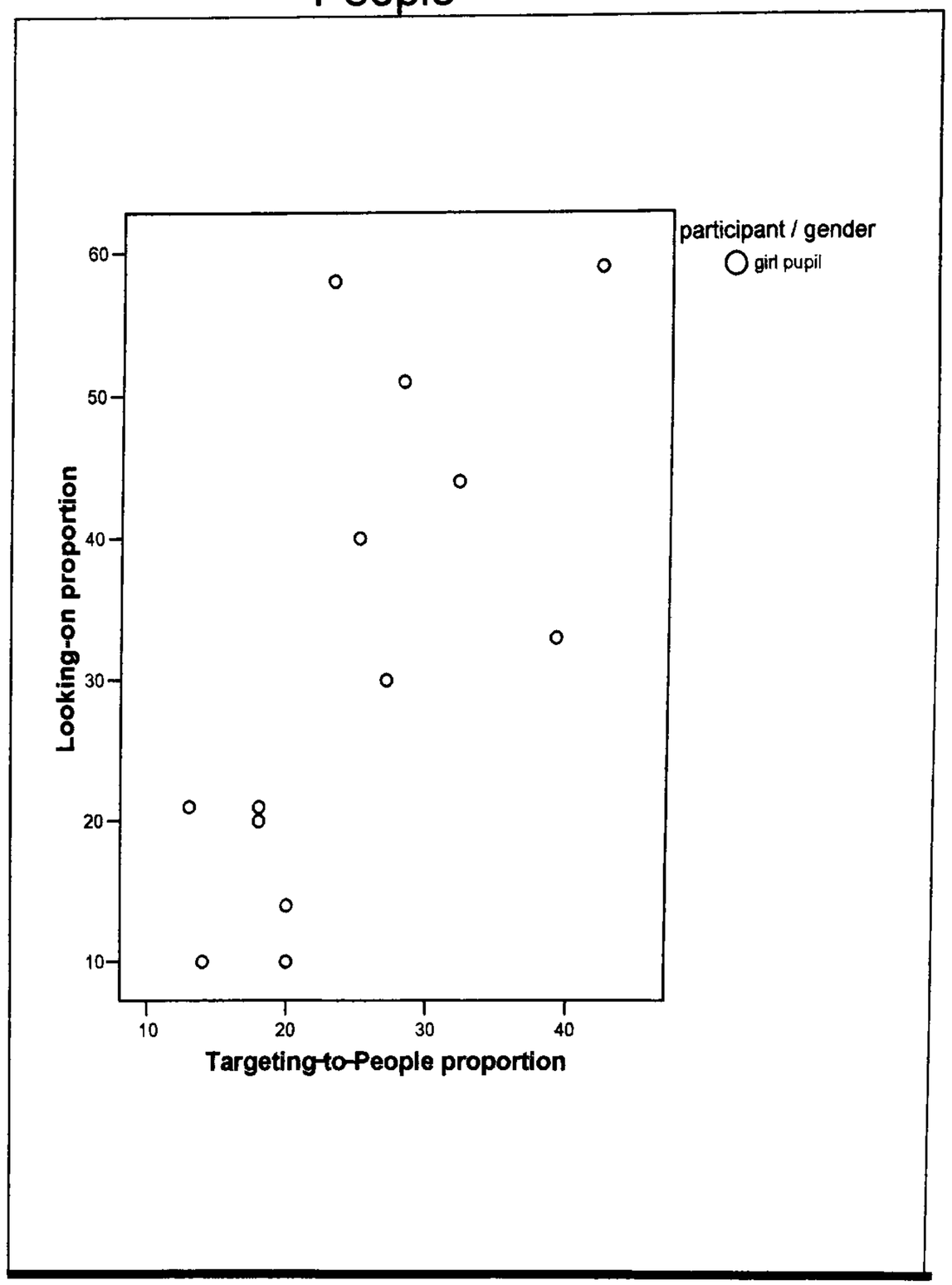
Note: Scatterplot created in SPSS v12.00

Figure 7.02 Scatterplot for TIG teachers: Looking-on X Targeting-to-People.



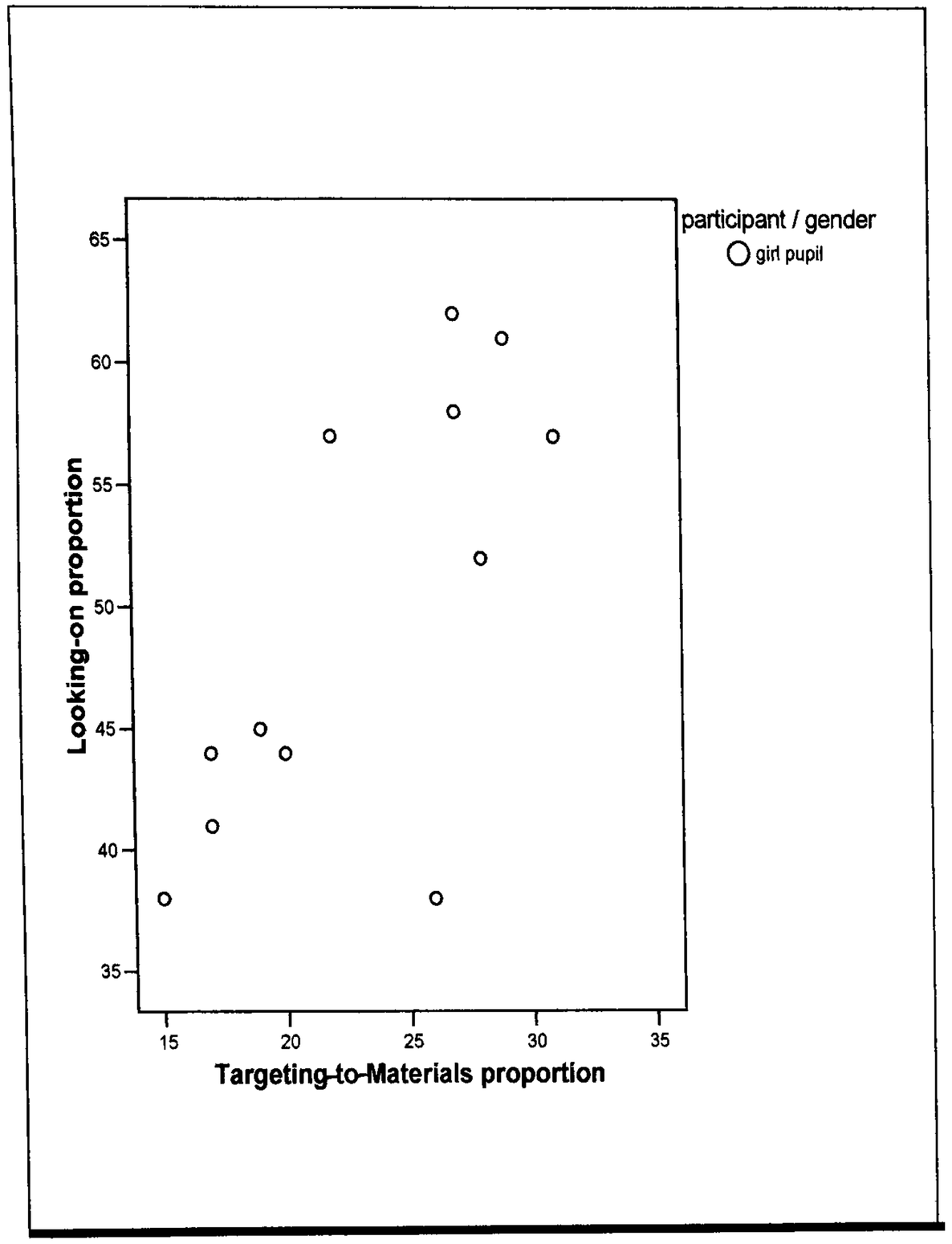
Note: Scatterplot created in SPSS v12.00

Figure 7.03 Scatterplot for TOG girls: Looking-on X Targeting-to-People



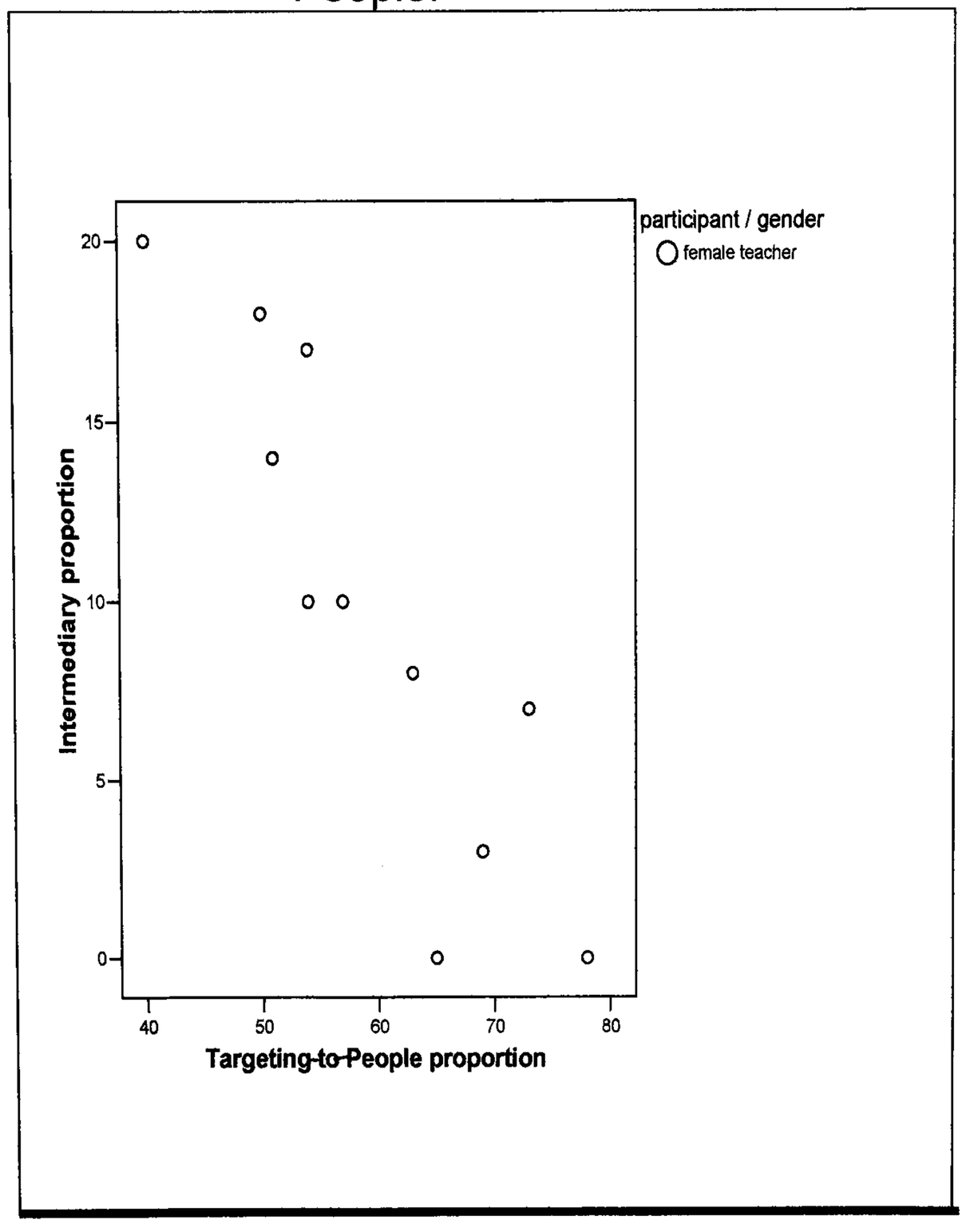
Note: Scatterplot created in SPSS v12.00

Figure 7.04 Scatterplot for TIG girls: Looking-on X Targeting-to-Materials.



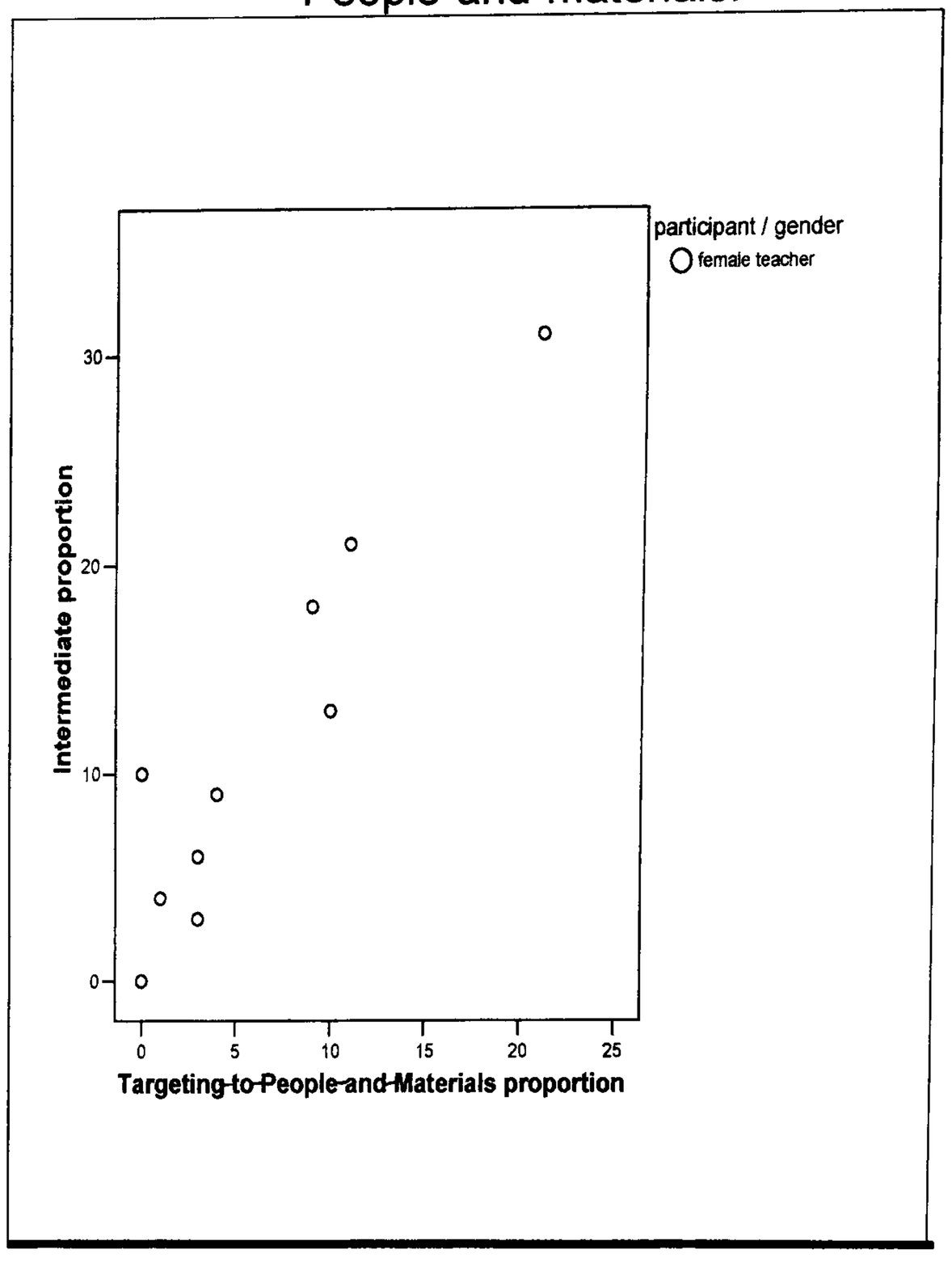
Note: Scatterplot created in SPSS v12.00

Figure 7.05 Scatterplot for TIG teachers: Intermediary X Targeting-to-People.



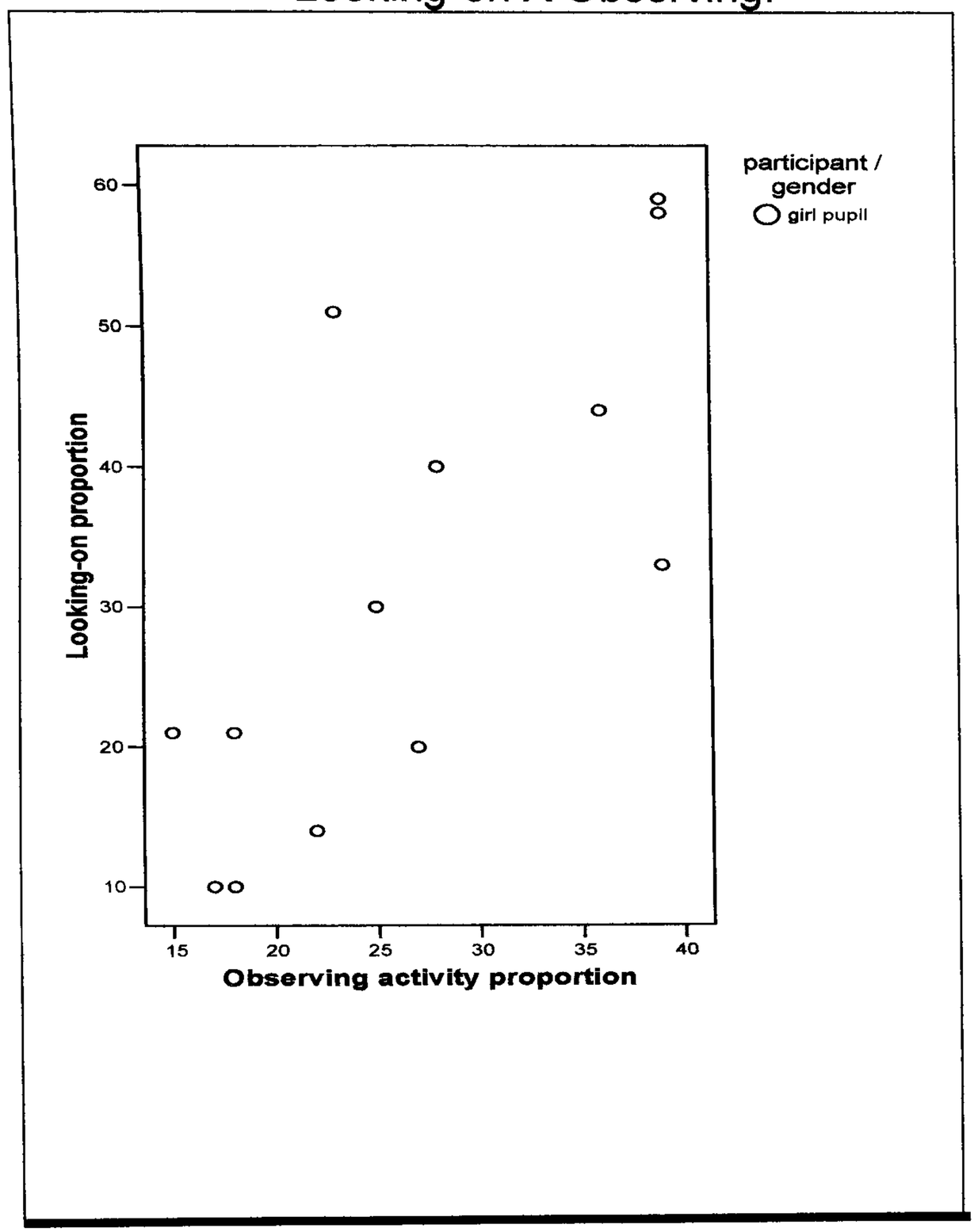
Note: Scatterplot created in SPSS v12.00

Figure 7.06 Scatterplot for TOG teachers: Intermediary X Targeting-to-People-and-materials.



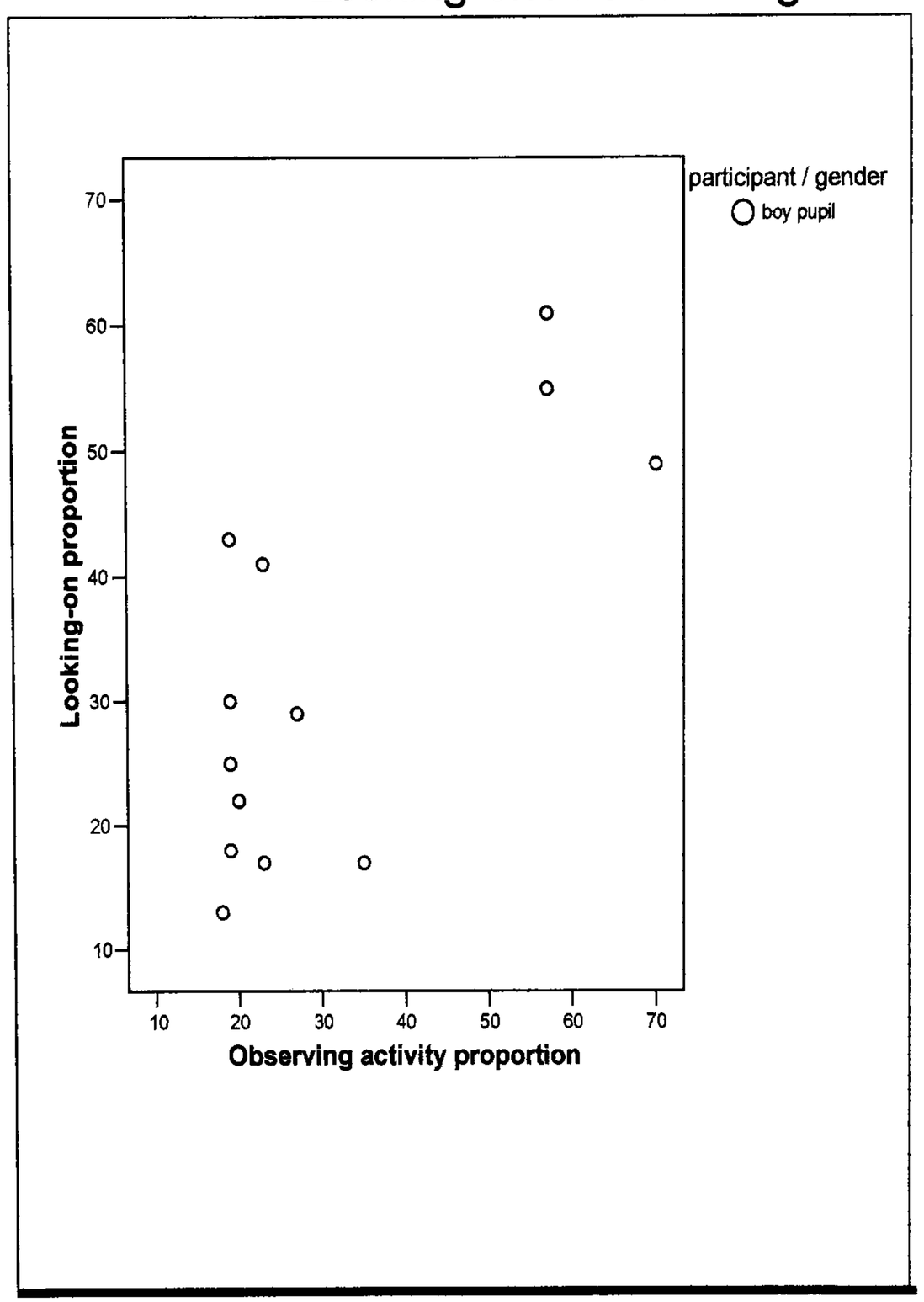
Note: Scatterplot created in SPSS v12.00

Figure 7.07 Scatterplot for TOG girls: Looking-on X Observing.



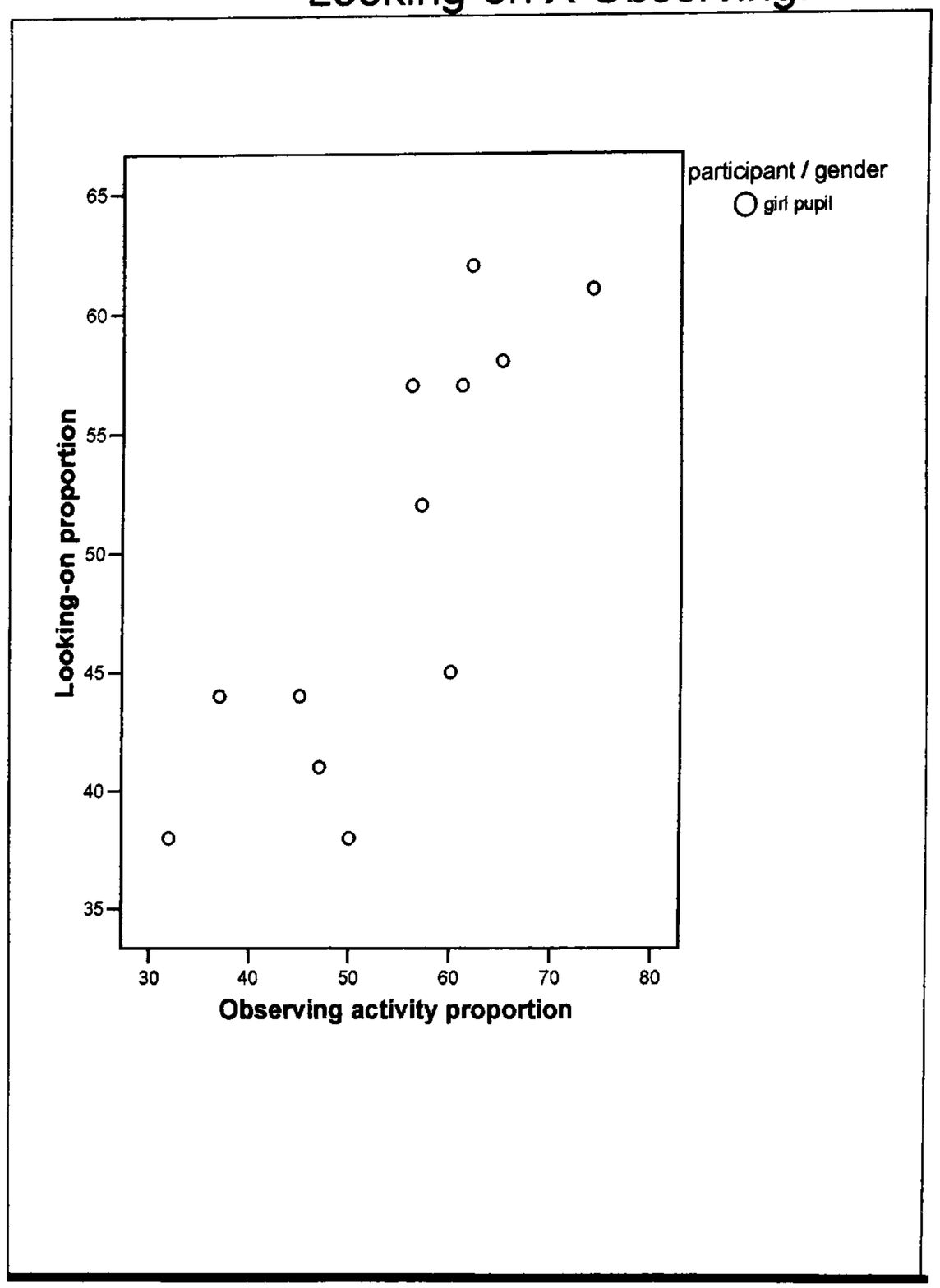
Note: Scatterplot created in SPSS v12.00

Figure 7.08 Scatterplot for TOG boys: Looking-on X Observing.



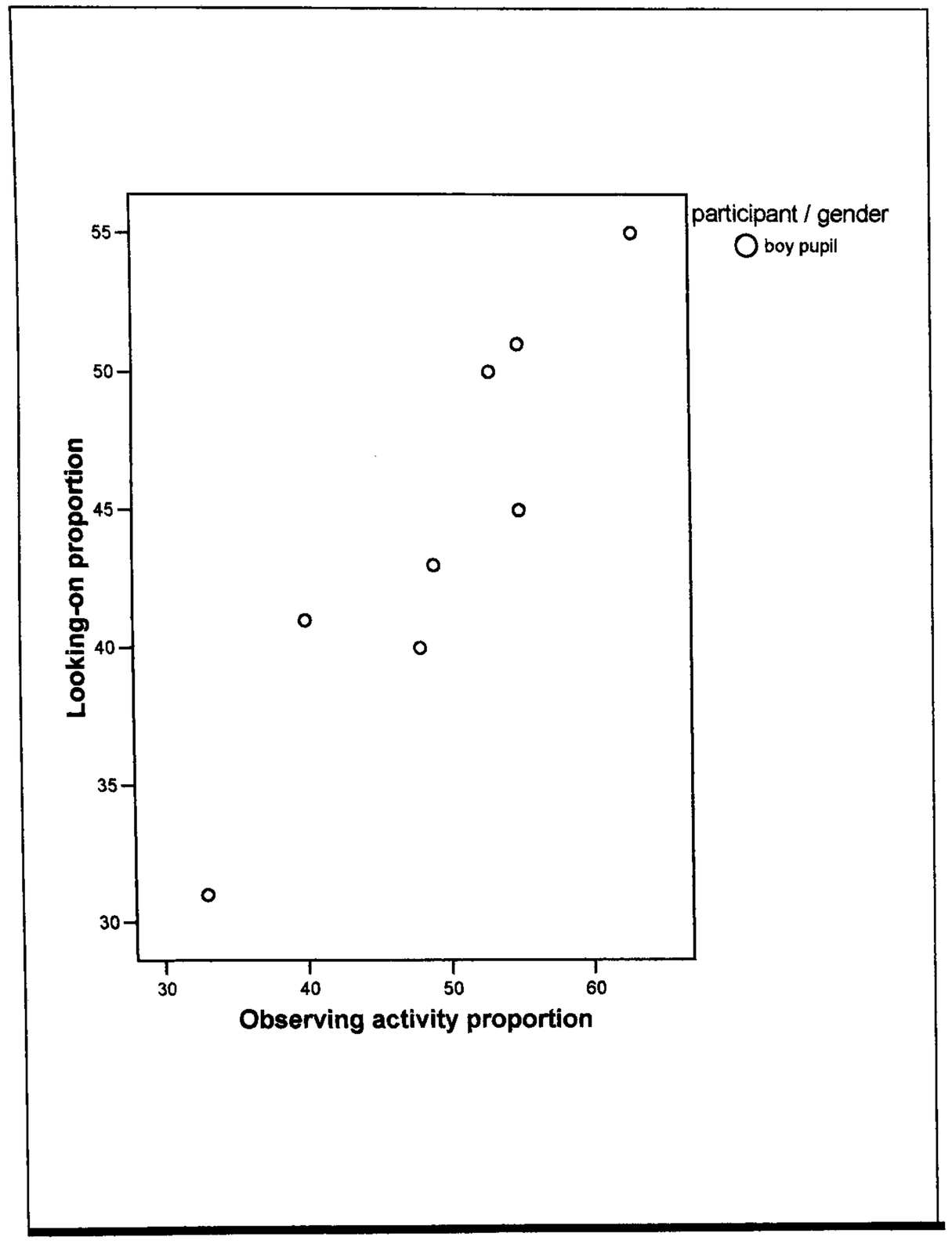
Note: Scatterplot created in SPSS v12.00

Figure 7.09 Scatterplot for TIG girls: Looking-on X Observing.



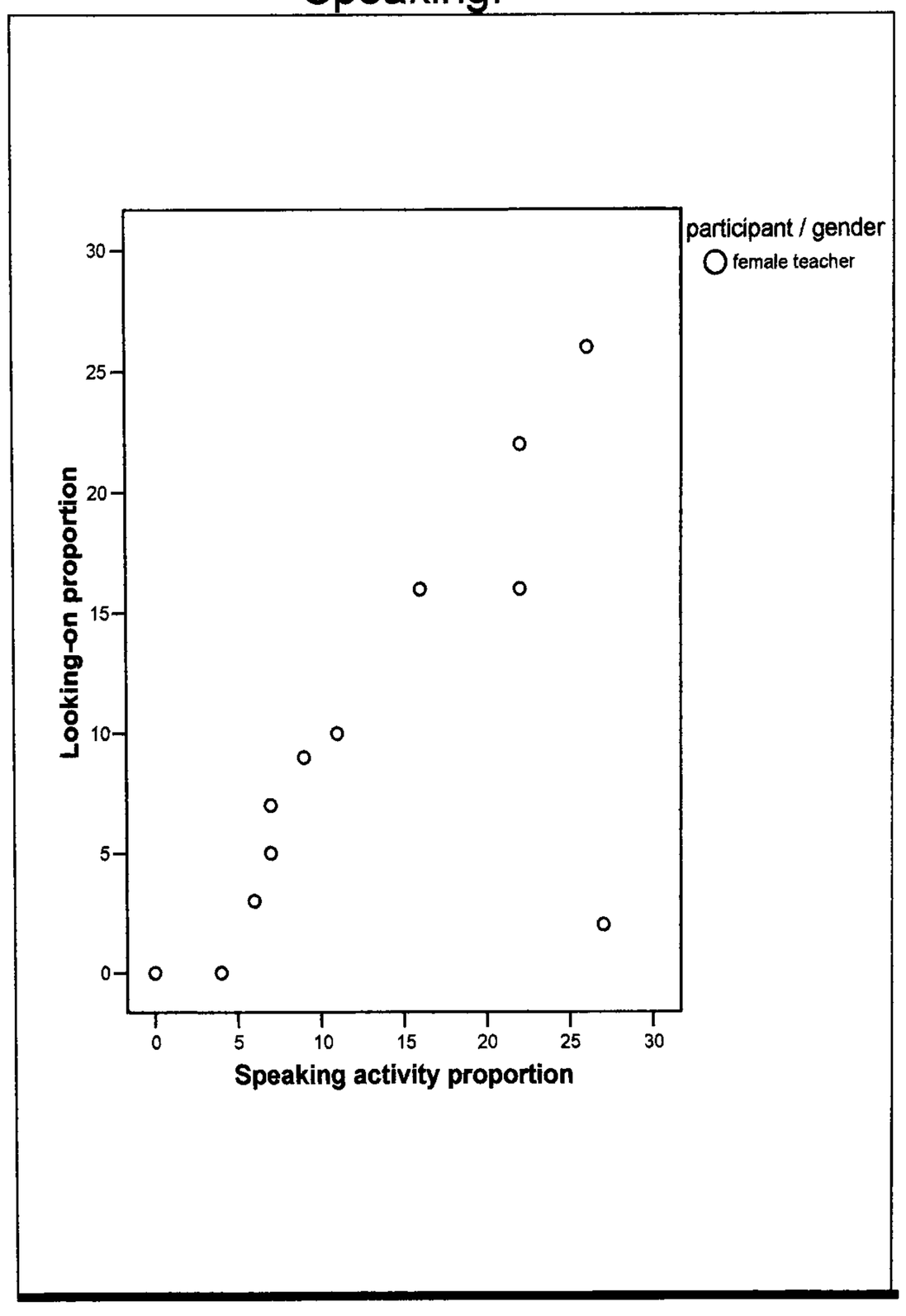
Note: Scatterplot created in SPSS v12.00

Figure 7.10 Scatterplot for TIG boys: Looking-on X Observing.



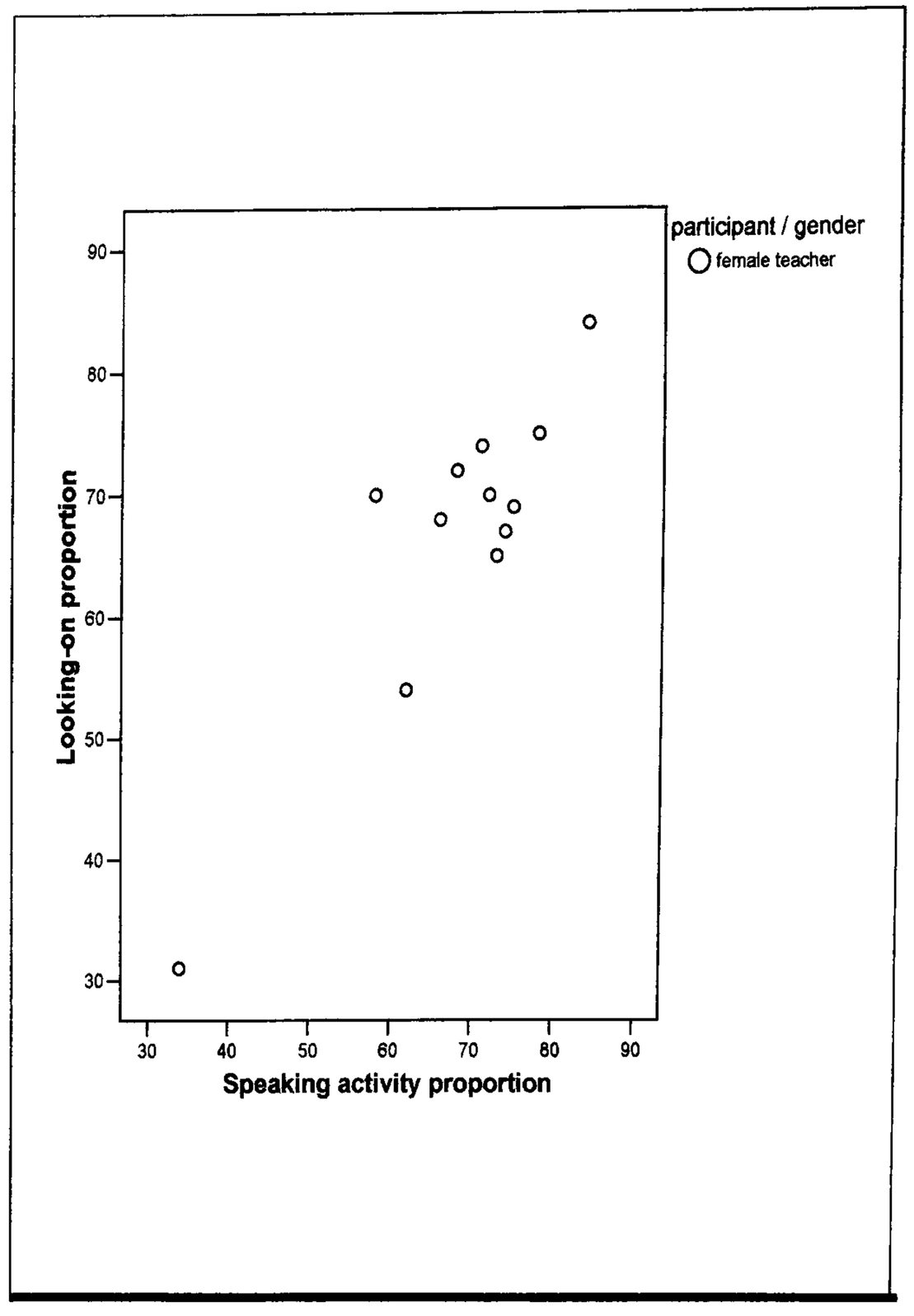
Note: Scatterplot created in SPSS v12.00

Figure 7.11 Scatterplot for TOG teachers: Looking-on X Speaking.



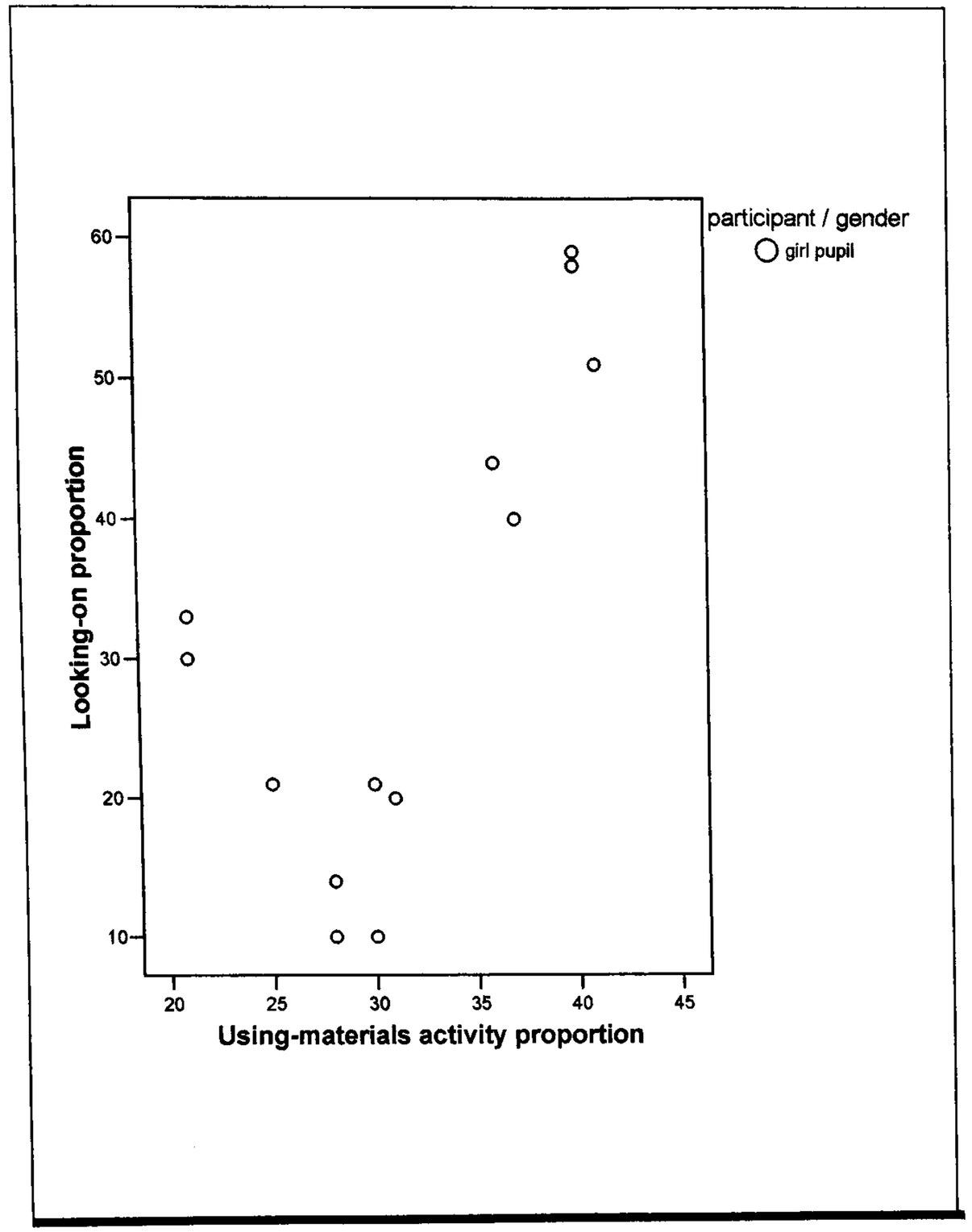
Note: Scatterplot created in SPSS v12.00

Figure 7.12 Scatterplot for TIG teachers: Looking-on X Speaking.



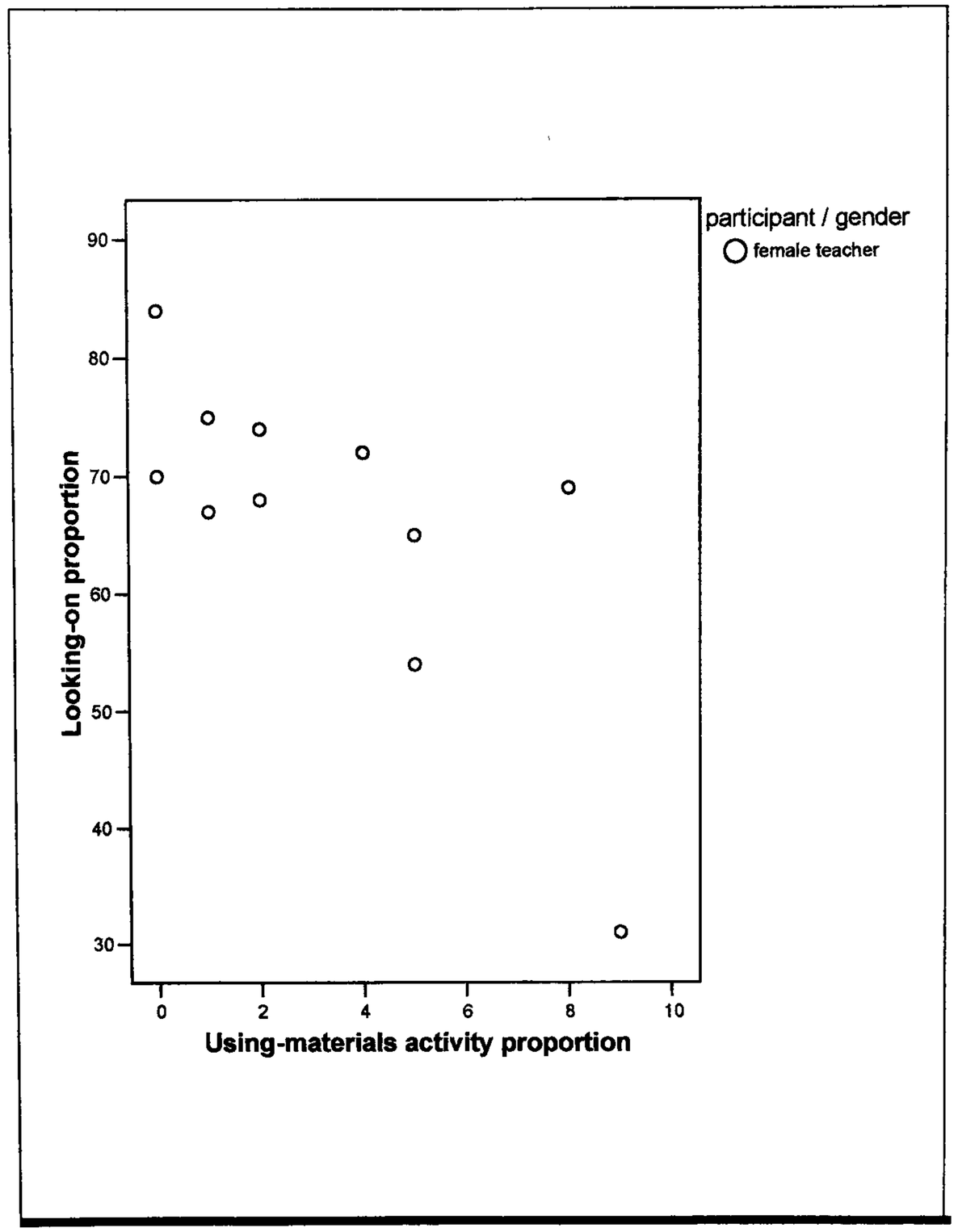
Note: Scatterplot created in SPSS v12.00

Figure 7.13 Scatterplot for TOG girls: Looking-on X Using-materials



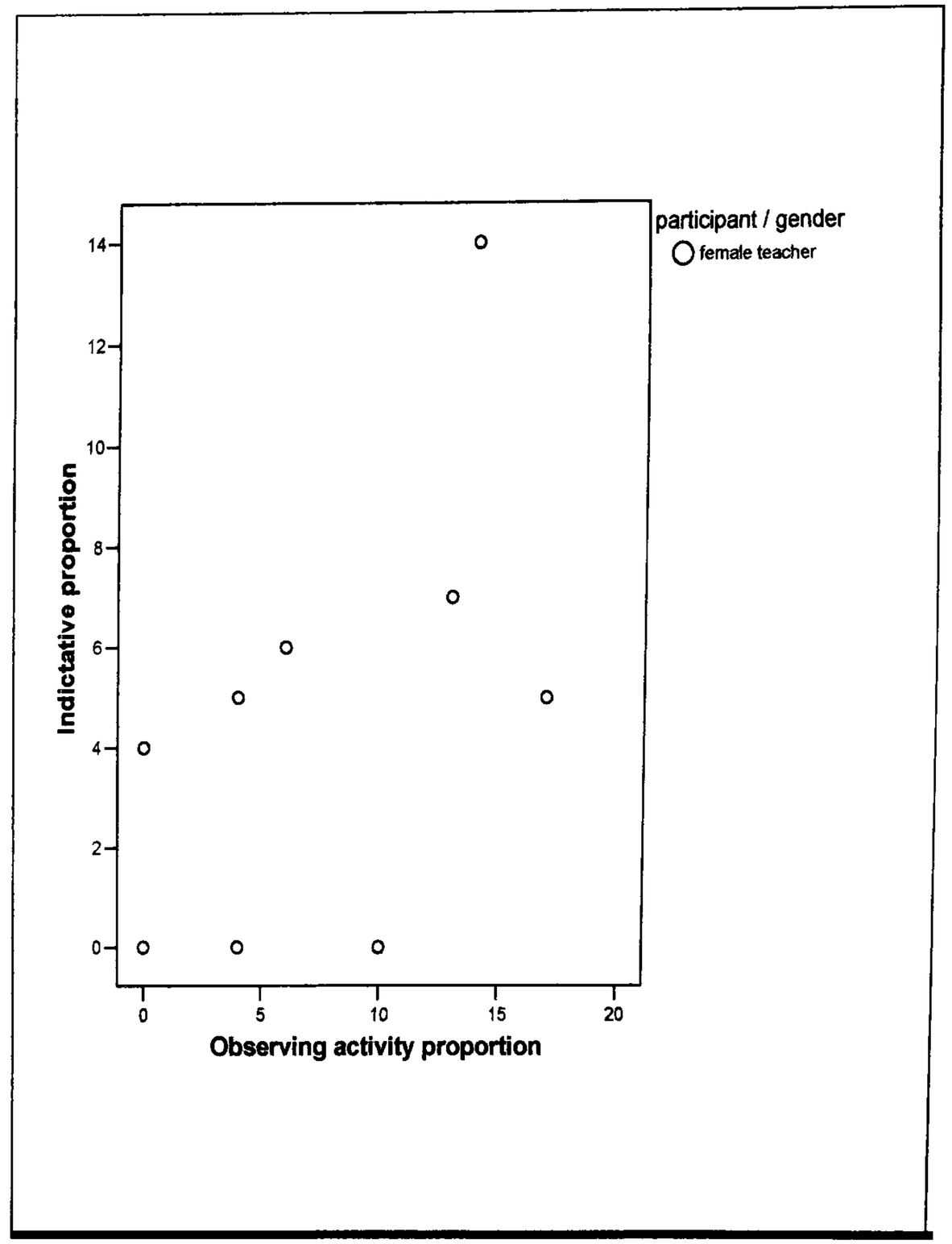
Note: Scatterplot created in SPSS v12.00

Figure 7.14 Scatterplot for TIG teachers: Looking-on X Using-materials.



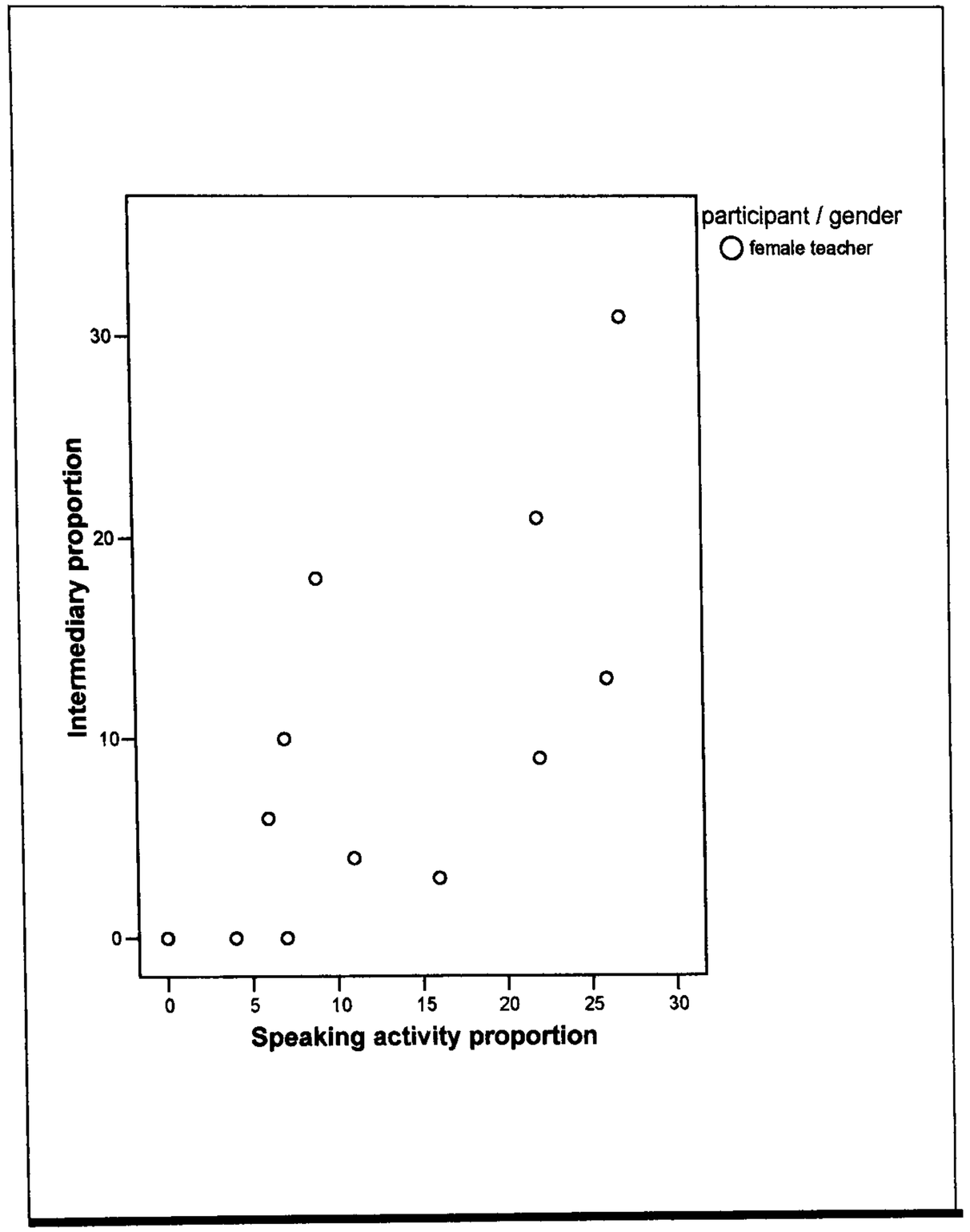
Note: Scatterplot created in SPSS v12.00

Figure 7.15 Scatterplot for TOG teachers: Indicative X Observing.



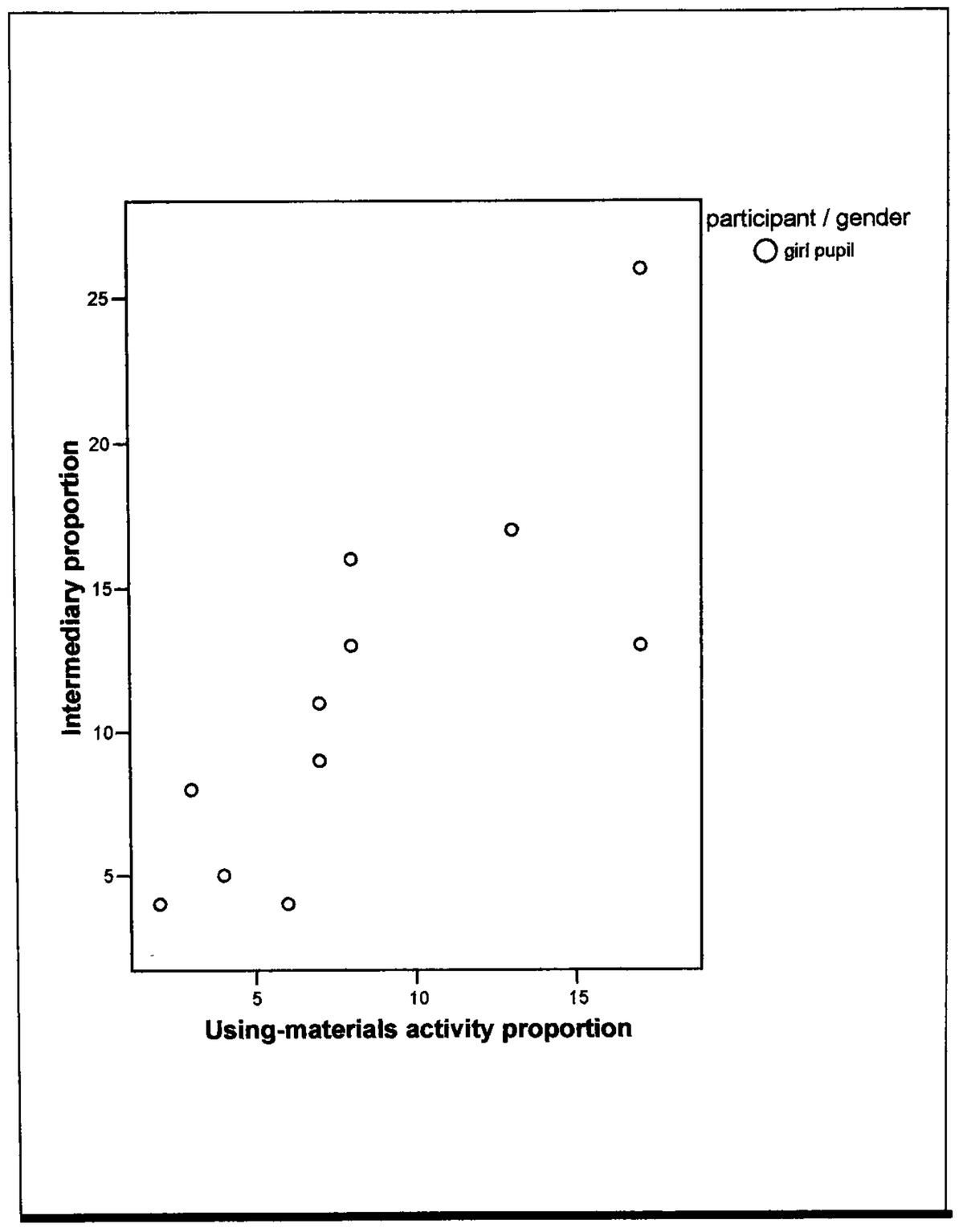
Note: Scatterplot created in SPSS v12.00

Figure 7.16 Scatterplot for TOG teachers: Intermediary X Speaking.



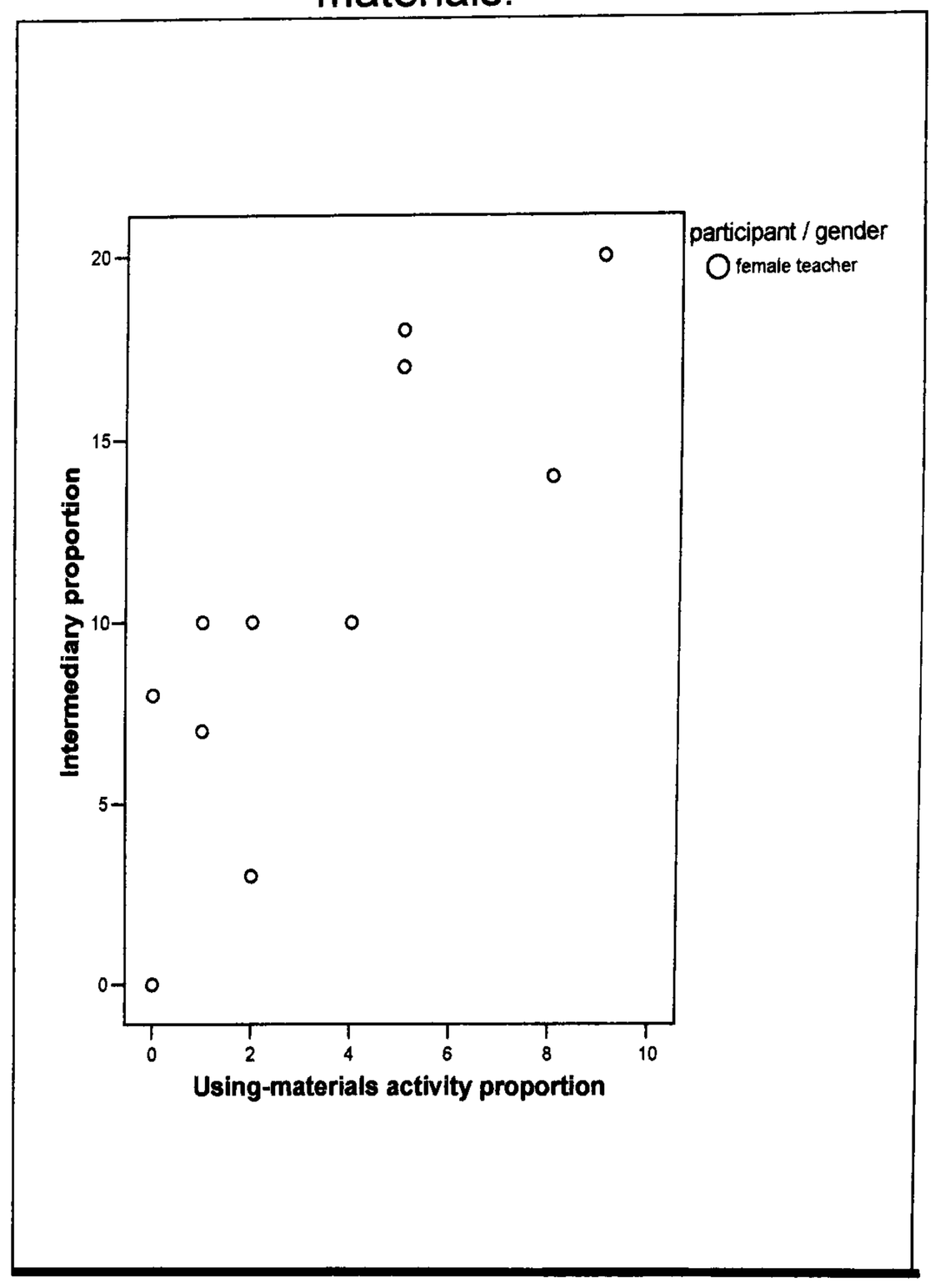
Note: Scatterplot created in SPSS v12.00

Figure 7.17 Scatterplot for TIG girls: Intermediary X Using-materials.



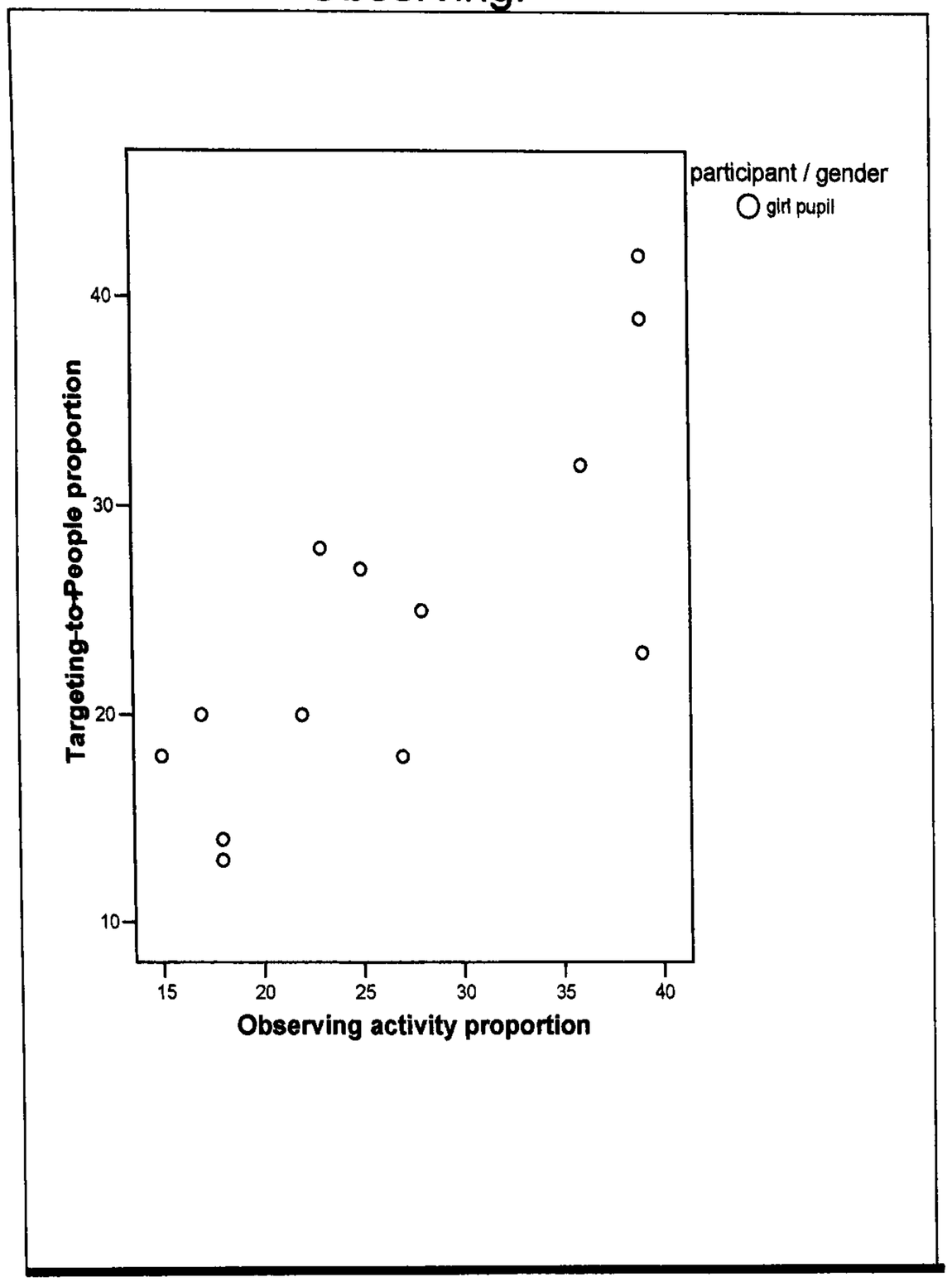
Note: Scatterplot created in SPSS v12.00

Figure 7.18 Scatterplot for TIG teachers: Intermediary X Using-materials.



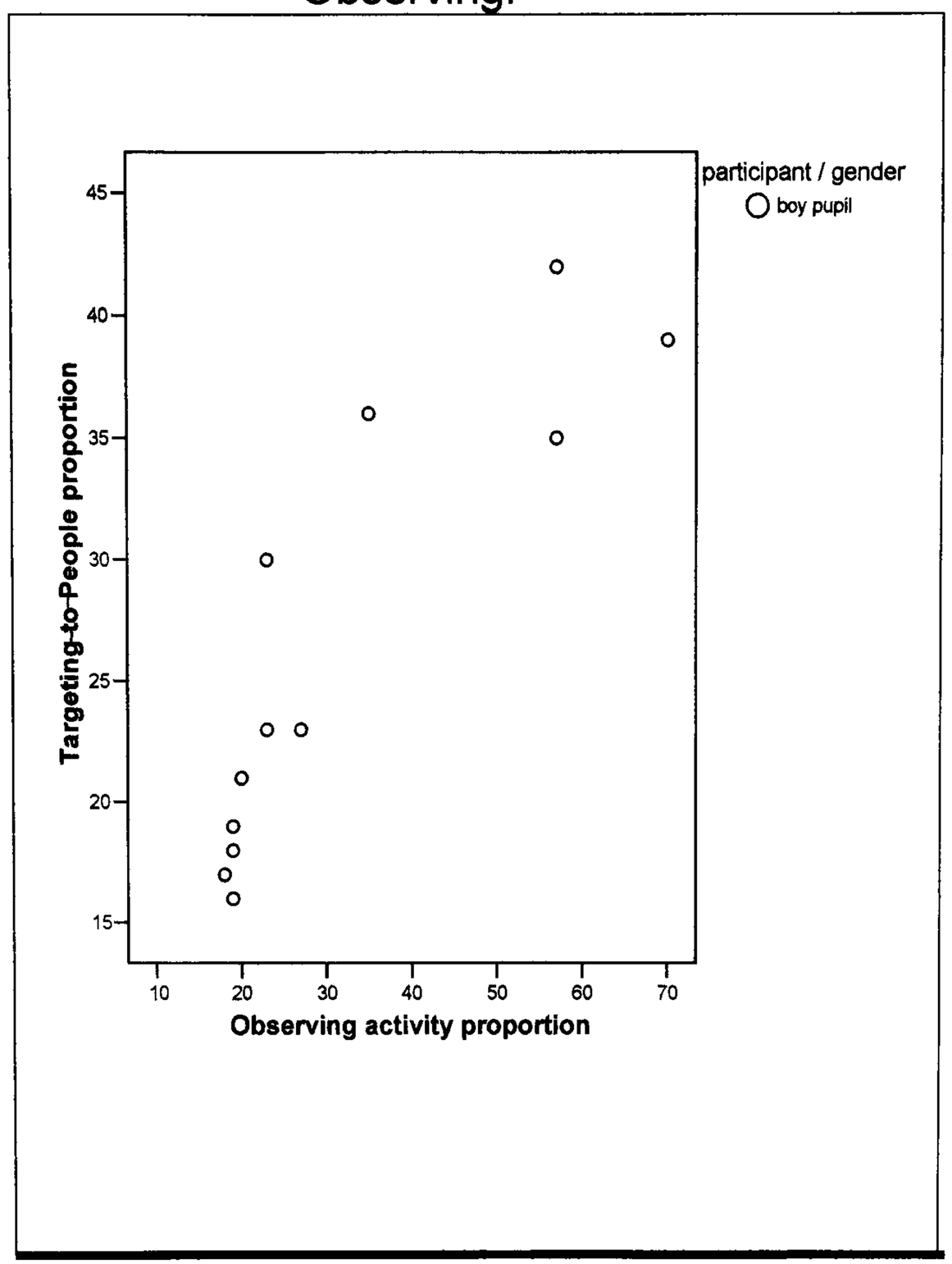
Note: Scatterplot created in SPSS v12.00

Figure 7.19 Scatterplot for TOG girls: Targeting-to-People X Observing.



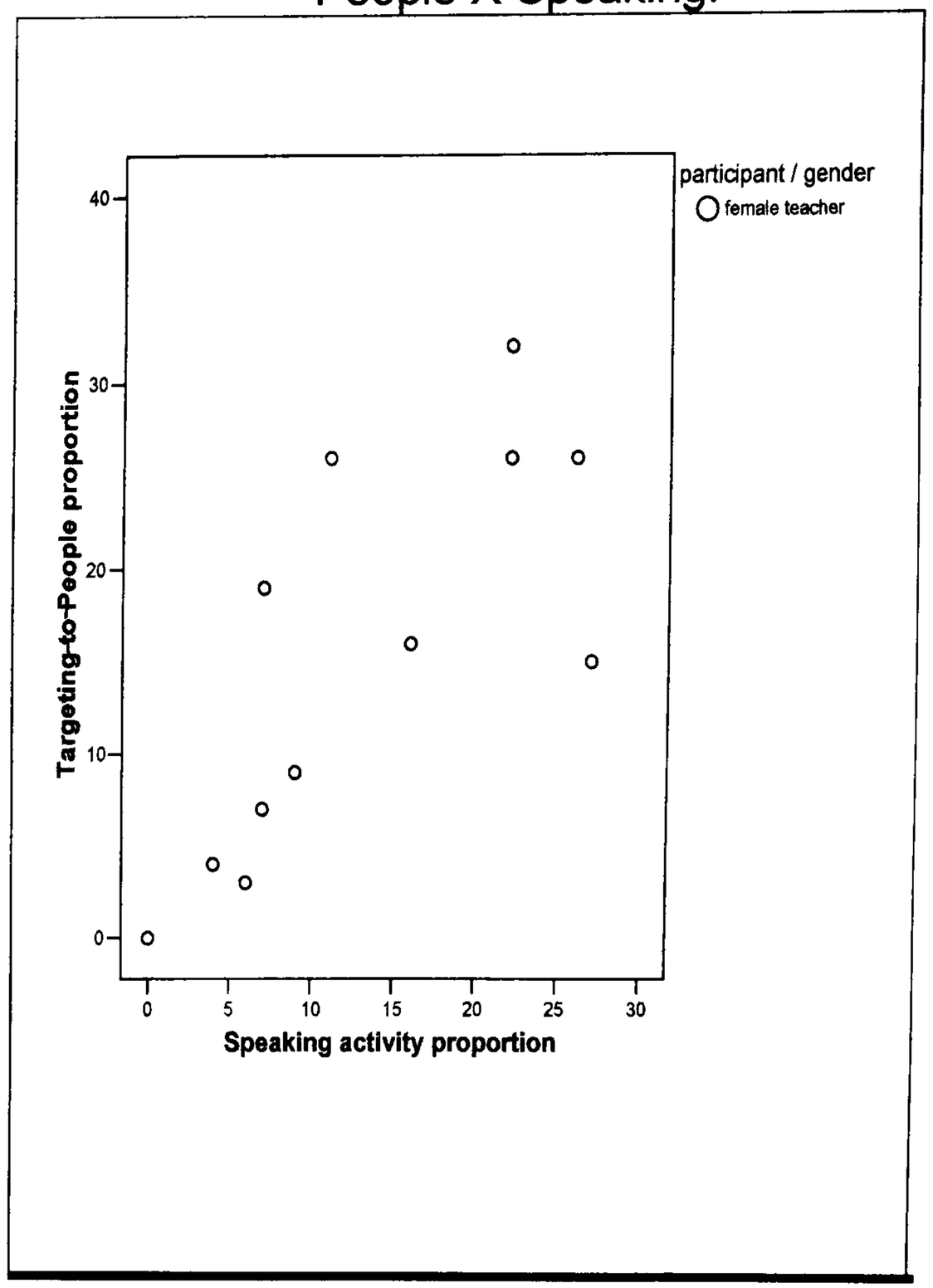
Note: Scatterplot created in SPSS v12.00

Figure 7.20 Scatterplot for TOG boys: Targeting-to-People X Observing.



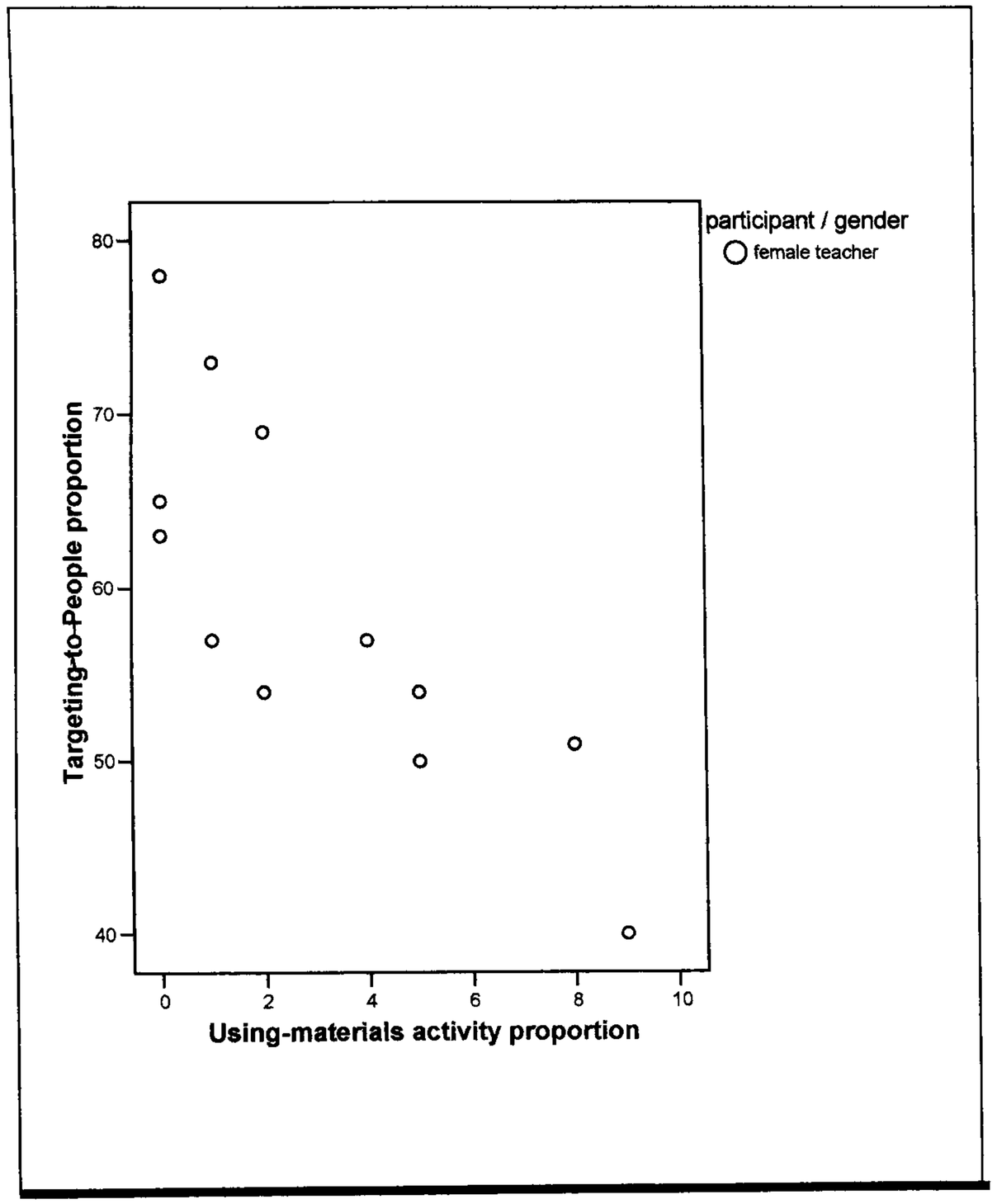
Note: Scatterplot created in SPSS v12.00

Figure 7.21 Scatterplot for TOG teachers: Targeting-to-People X Speaking.



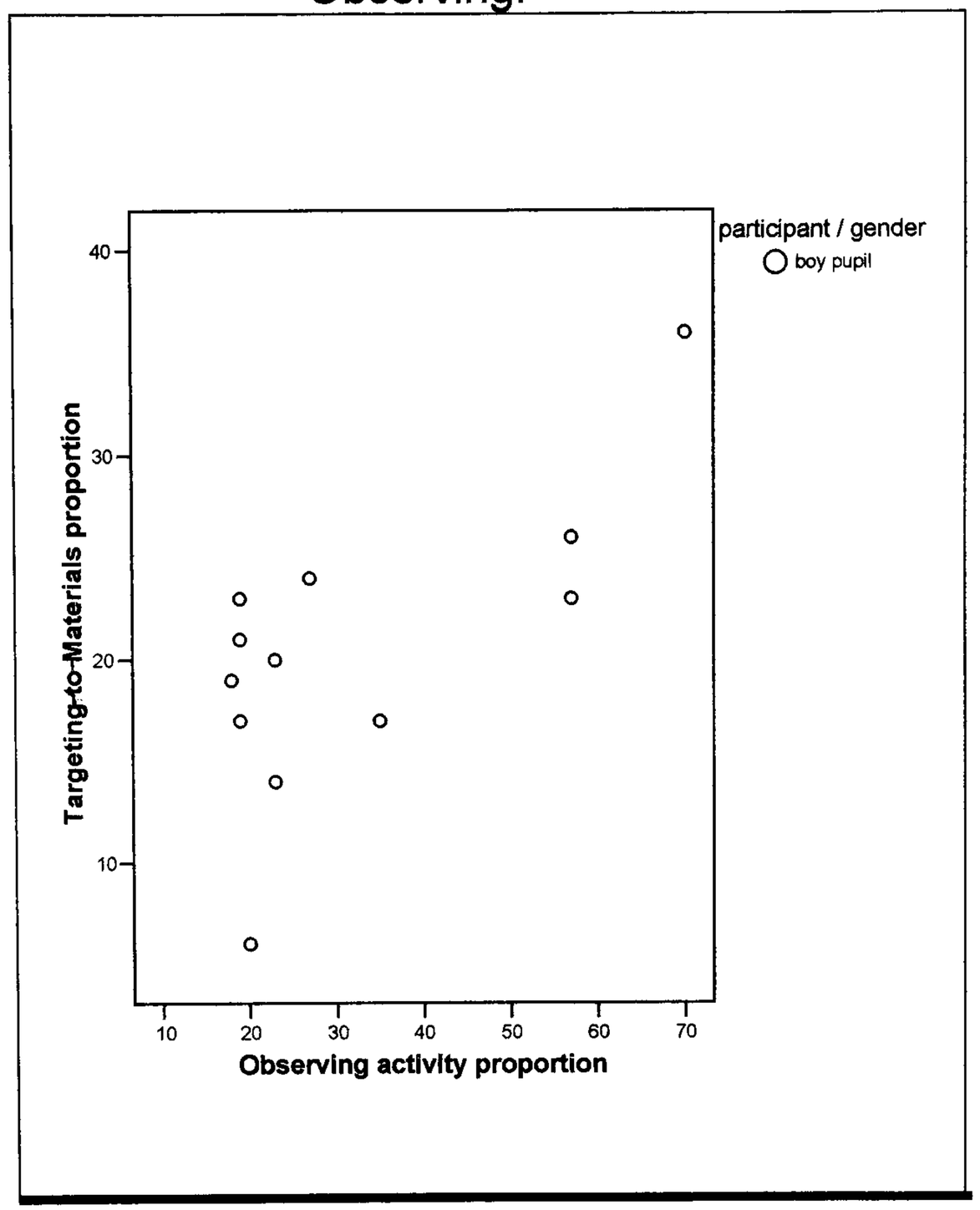
Note: Scatterplot created in SPSS v12.00

Figure 7.22 Scatterplot for TIG teachers: Targeting-to-People X Using-materials.



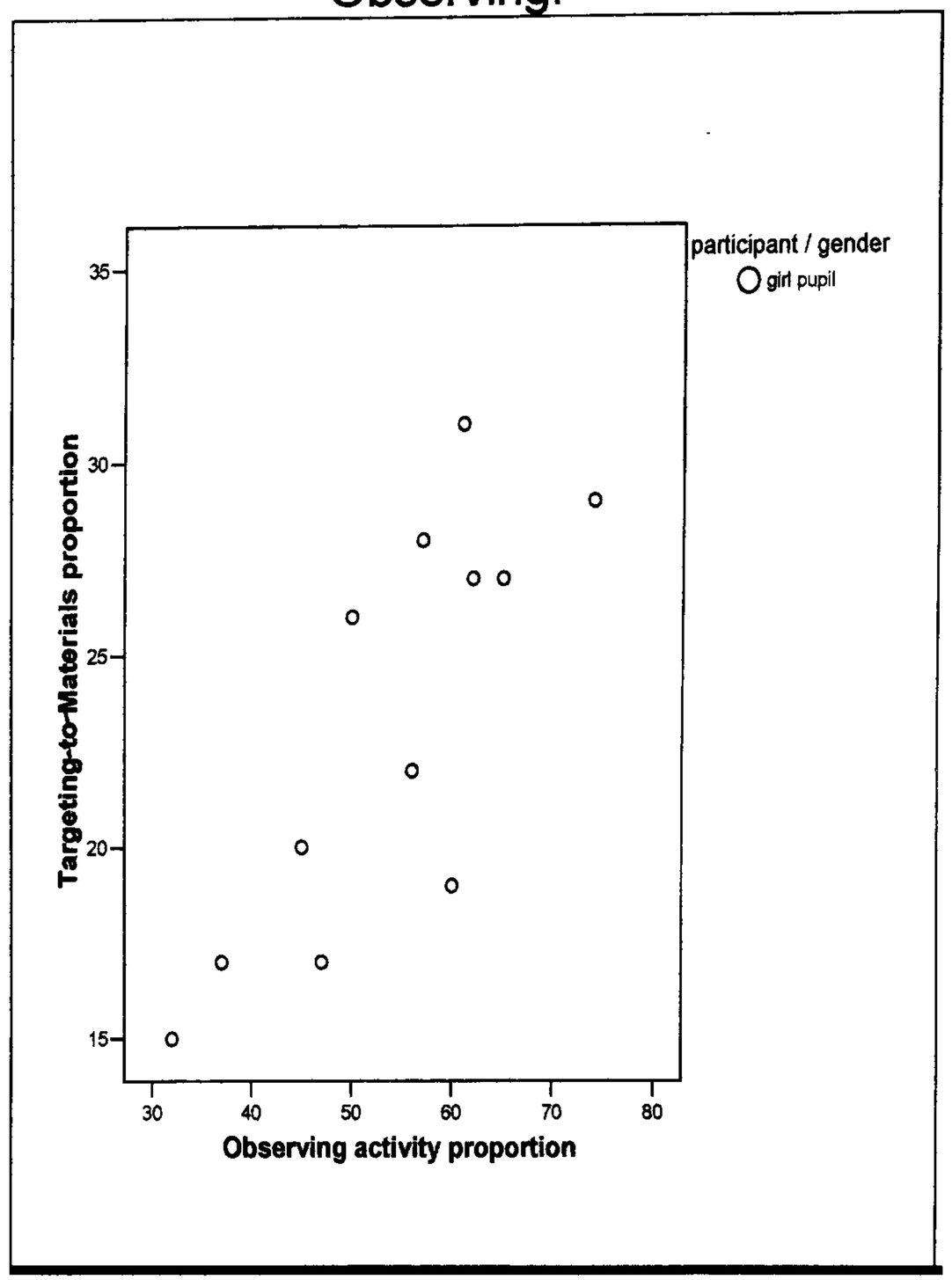
Note: Scatterplot created in SPSS v12.00

Figure 7.23 Scatterplot for TOG boys: Targeting-to-Materials X Observing.



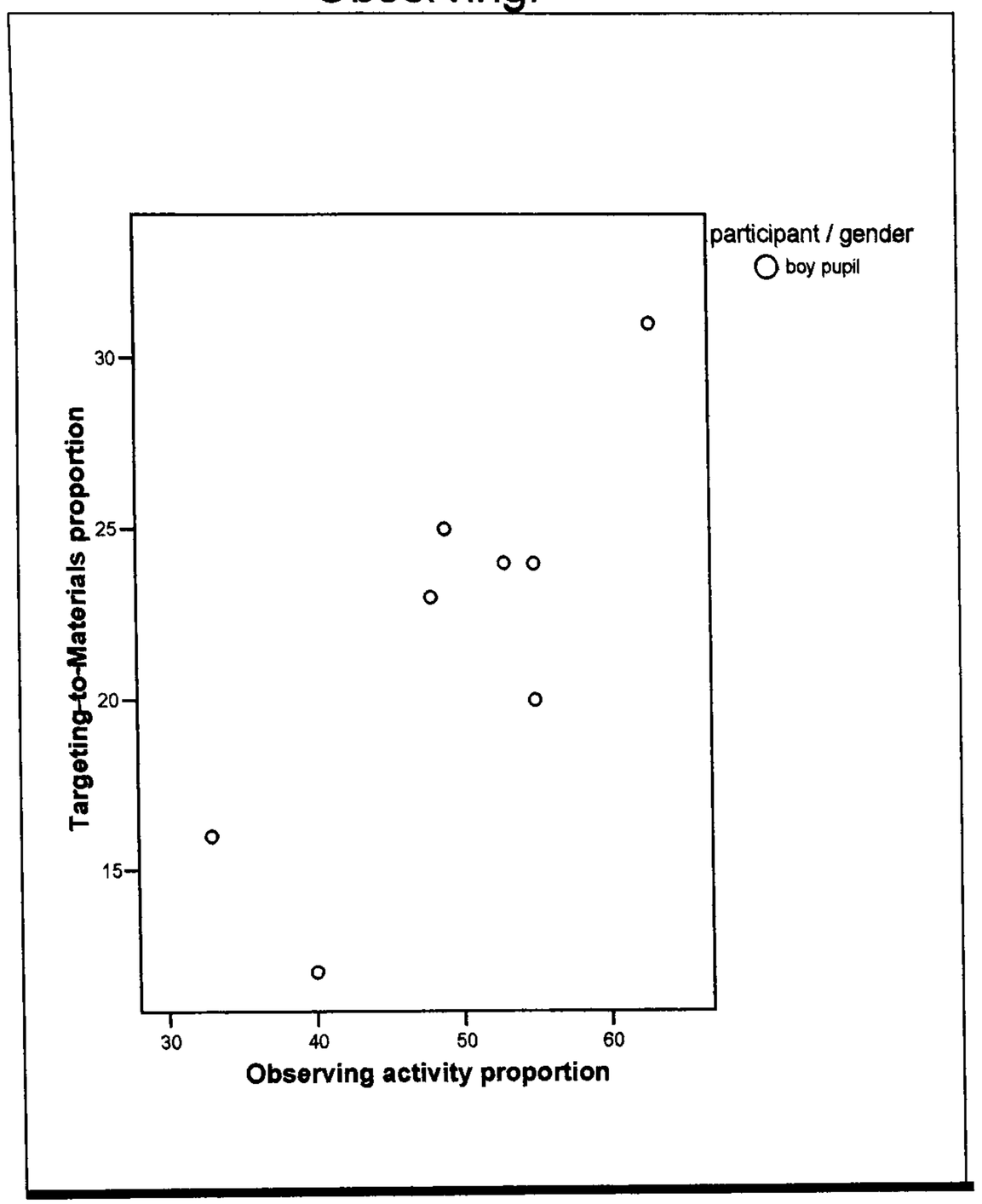
Note: Scatterplot created in SPSS v12.00

Figure 7.24 Scatterplot for TIG girls: Targeting-to-Materials X Observing.



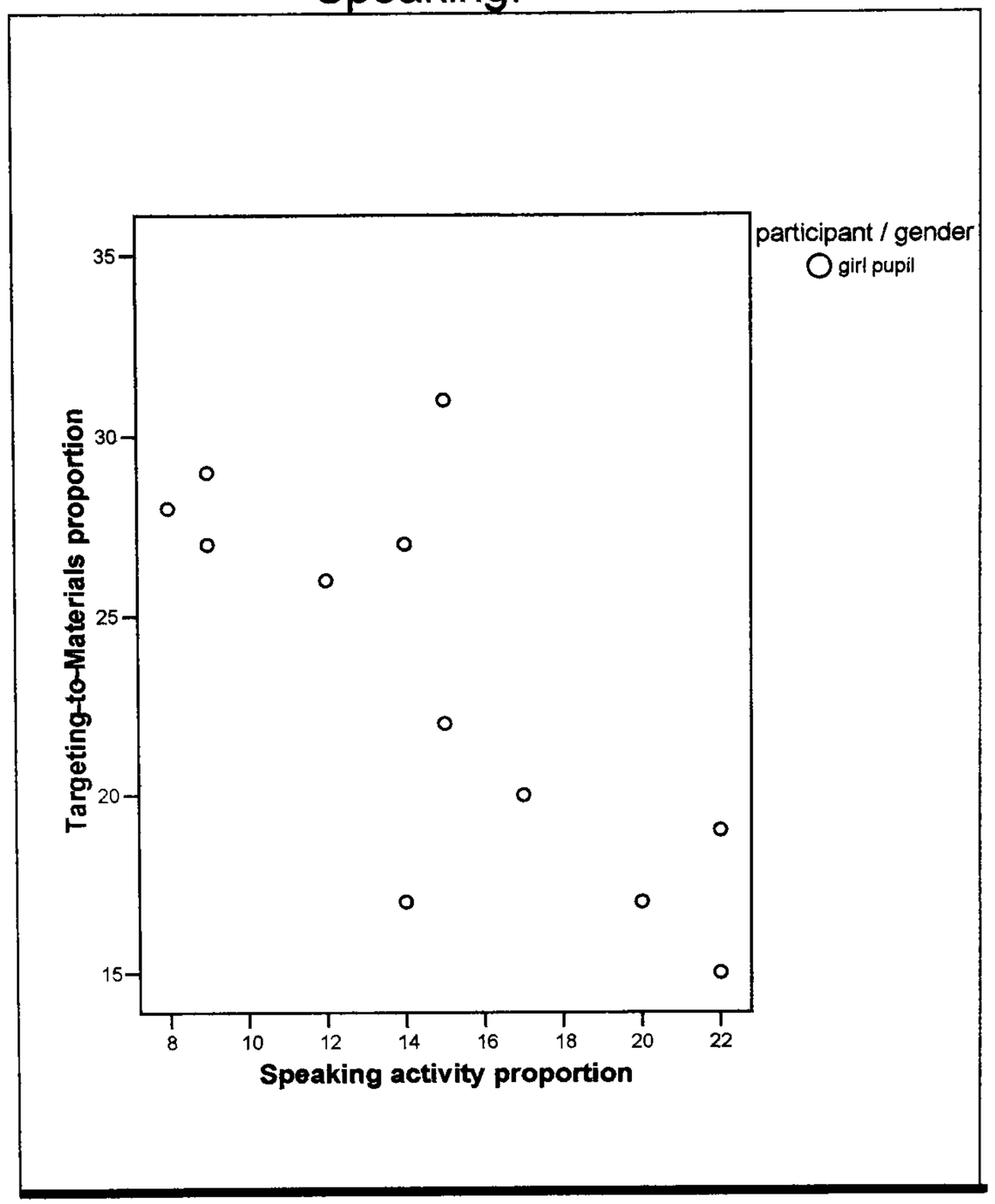
Note: Scatterplot created in SPSS v12.00

Figure 7.25 Scatterplot for TIG boys: Targeting-to-Materials X Observing.



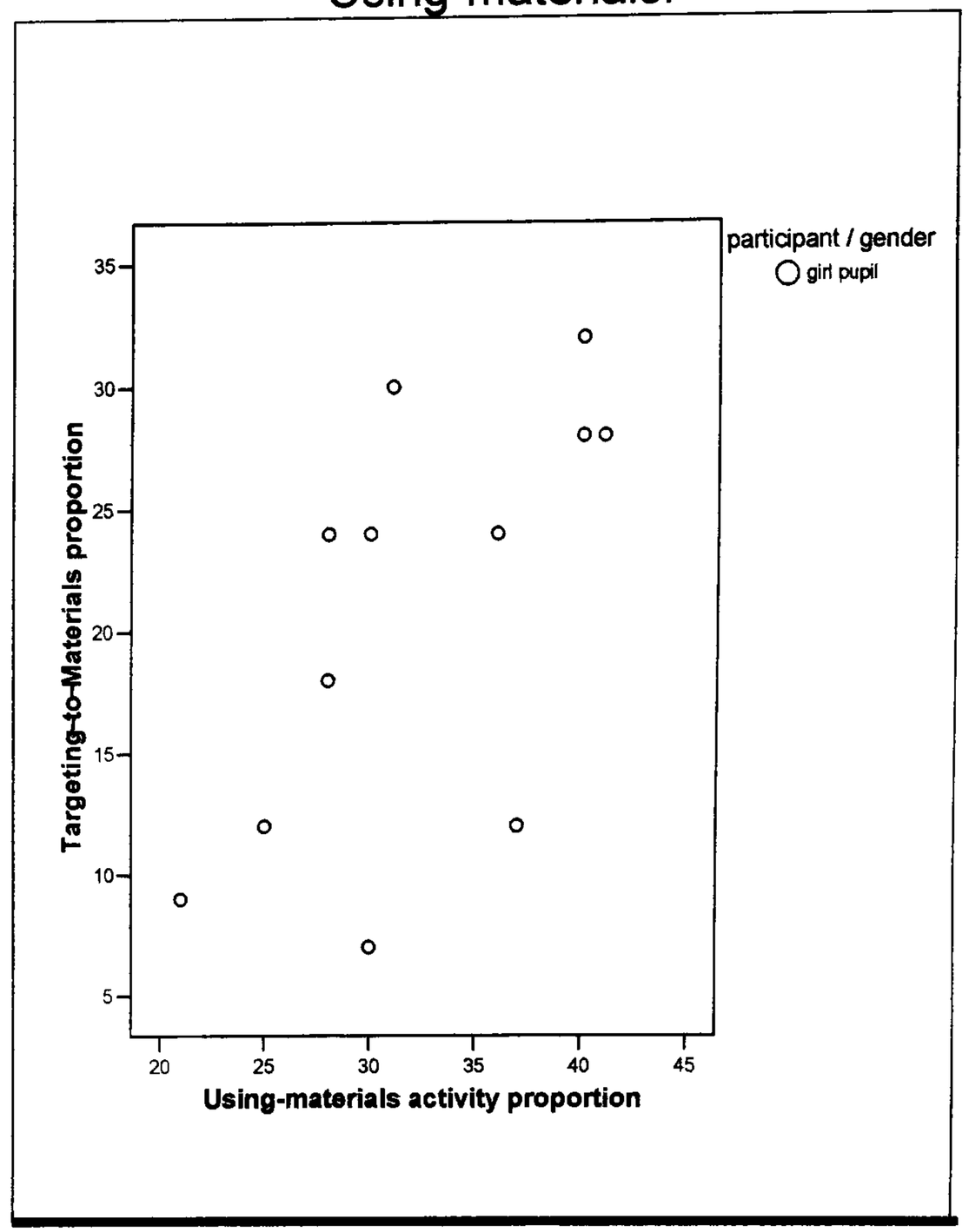
Note: Scatterplot created in SPSS v12.00

Figure 7.26 Scatterplot for TIG girls: Targeting-to-Materials X Speaking.



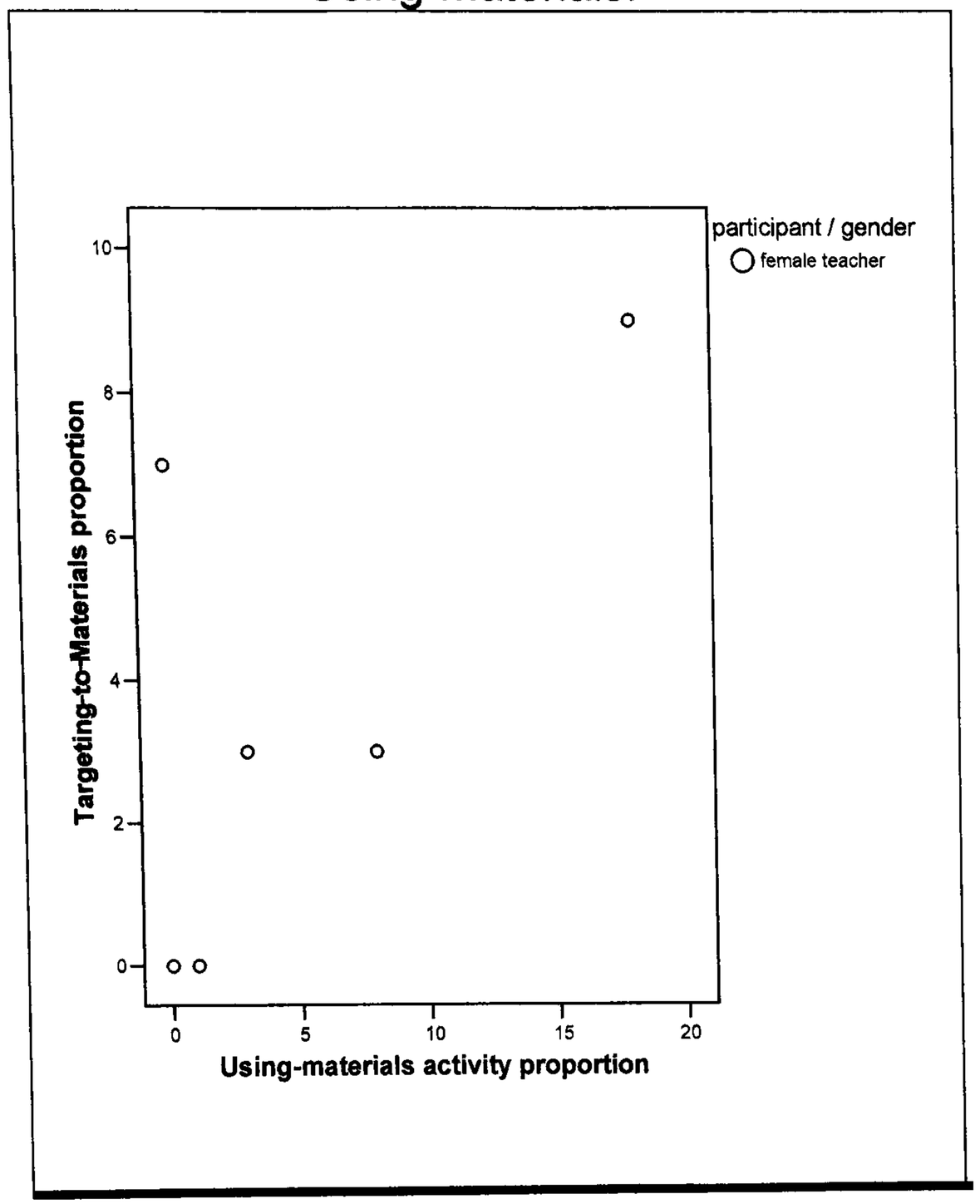
Note: Scatterplot created in SPSS v12.00

Figure 7.27 Scatterplot for TOG girls: Targeting-to-Materials X Using-materials.



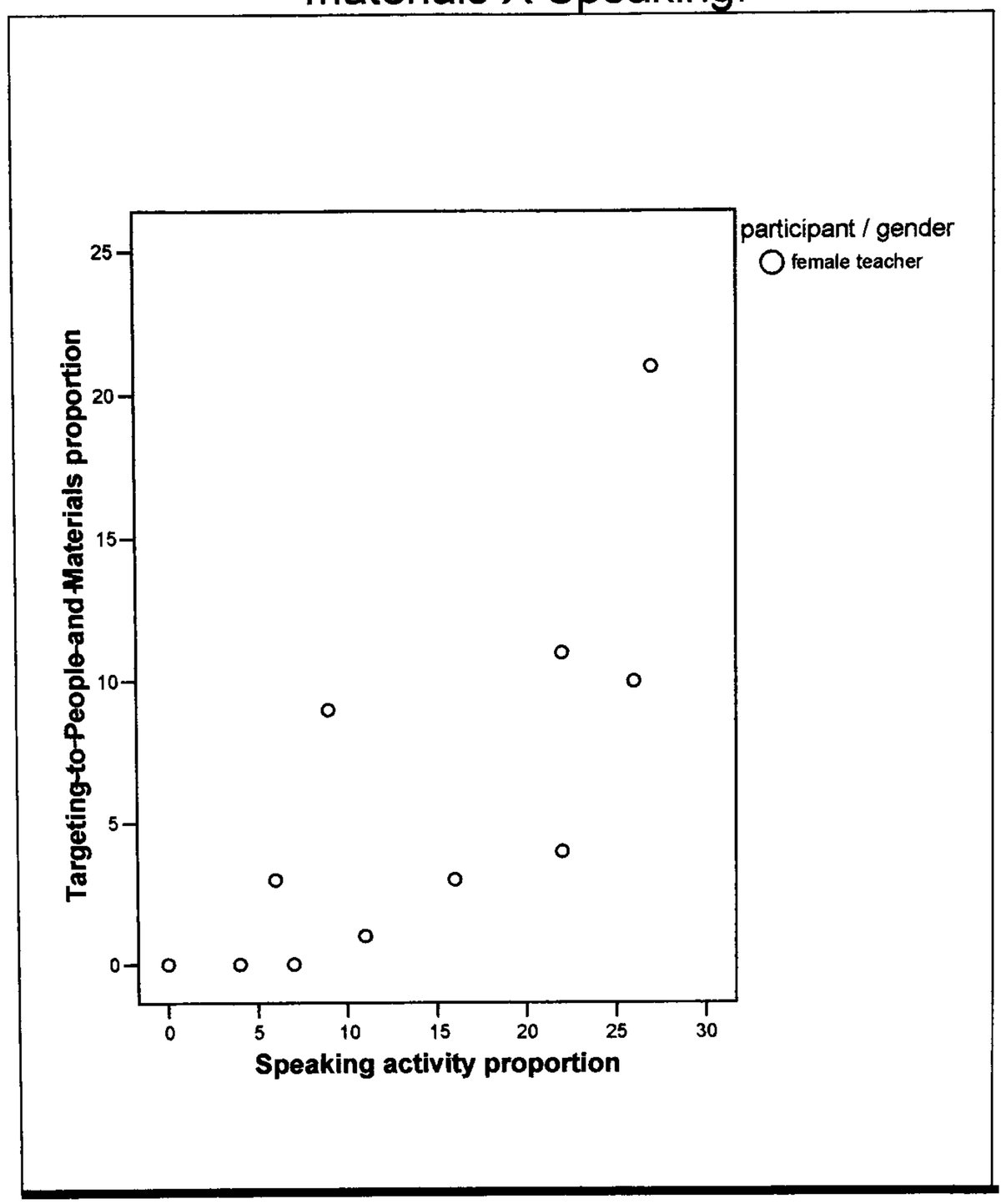
Note: Scatterplot created in SPSS v12.00

Figure 7.28 Scatterplot for TOG teachers: Targeting-to-Materials X Using-materials.



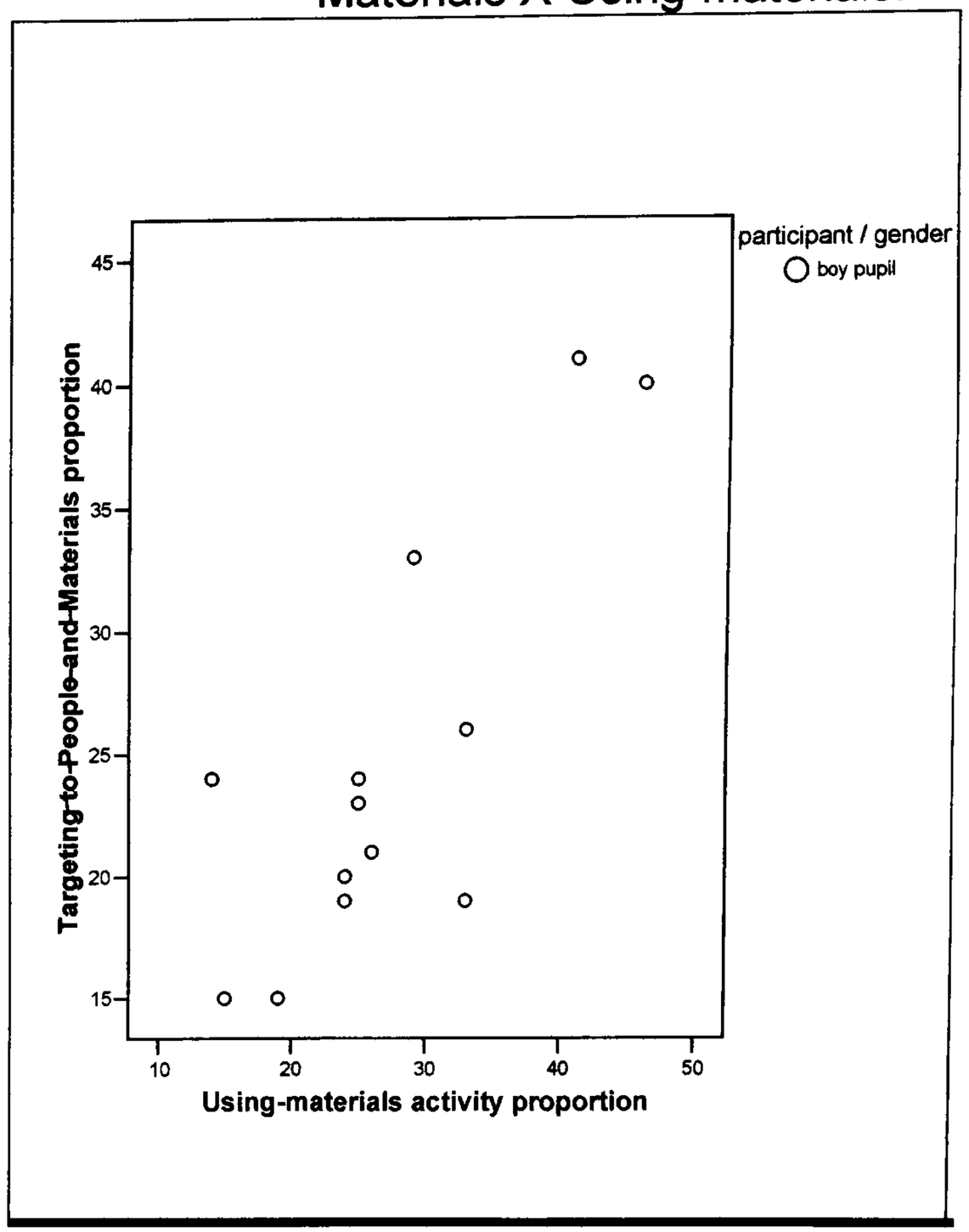
Note: Scatterplot created in SPSS v12.00
NB. Many values for pairs of data points were both zero.

Figure 7.29 Scatterplot for TOG teachers: Targeting-to-People-and-materials X Speaking.



Note: Scatterplot created in SPSS v12.00

Figure 7.30 Scatterplot for TOG boys: Targeting-to-People-and-Materials X Using-materials.



Note: Scatterplot created in SPSS v12.00

Appendix 8

'Pooled' data analysis and related Non-Parametric test data

Table 8.01a Proportion database ('Pool' data) sorted by: TOG and TIG groups and participant type – page 1.

Task group	Part. Type	Obs. in task	*Proportion[a] of observations counted in each gesture category*				Proportion of observations counted in each gesture-target category				Proportion observations counted in each task-activity category			
			P	*L*	*I*	*In*	Nt	Pt	M	Pm	Na	O	S	U
TOG1a1	g	81	.58	.10	.10	.22	.58	.11	.06	.25	.58	.16	.04	.22
TOG1a1	g	81	.59	.06	.09	.26	.59	.10	.06	.25	.58	.14	.03	.26
TOG1a1	g	81	.35	.14	.10	.42	.35	.21	.10	.35	.32	.24	.04	.41
TOG1a2	g	67	.36	.10	.09	.45	.36	.22	.18	.24	.36	.15	.12	.37
TOG1a2	g	67	.48	.12	.12	.28	.48	.15	.21	.16	.49	.19	.10	.21
TOG1a2	g	67	.28	.09	.13	.49	.28	.24	.16	.31	.28	.16	.28	.27
TOG1a3	g	25	.36	.20	.04	.40	.36	.08	.40	.16	.36	.24	.04	.36
TOG1a3	g	25	.20	.08	.16	.56	.20	.32	.16	.32	.20	.20	.40	.20
TOG1b1	g	11	.36	.27	.00	.36	.36	.36	.09	.18	.36	.36	.00	.27
TOG1b1	g	11	.27	.36	.00	.36	.27	.36	.09	.27	.27	.55	.00	.18
TOG1b1	g	11	.18	.36	.00	.46	.18	.46	.09	.27	.18	.55	.09	.18
TOG1b2	g	36	.36	.17	.06	.42	.36	.19	.25	.19	.36	.25	.08	.31
TOG1b2	g	36	.36	.25	.03	.36	.36	.17	.33	.14	.36	.33	.06	.25
TOG1b2	g	36	.28	.17	.11	.44	.28	.17	.33	.22	.28	.22	.14	.36
TOG1b3	g	28	.29	.14	.04	.54	.29	.14	.11	.46	.29	.14	.21	.36
TOG1b3	g	28	.21	.39	.04	.36	.21	.36	.11	.32	.21	.32	.32	.14
TOG1b3	g	28	.39	.36	.00	.25	.39	.32	.04	.25	.39	.29	.18	.14
TOG2a1	g	31	.26	.58	.03	.13	.26	.19	.36	.19	.26	.29	.07	.39
TOG2a1	g	31	.13	.48	.13	.26	.13	.32	.26	.29	.13	.29	.16	.42
TOG2a1	g	31	.19	.48	.07	.26	.19	.32	.23	.26	.23	.10	.26	.42
TOG2a3	g	25	.16	.40	.12	.32	.16	.32	.28	.24	.16	.40	.00	.44
TOG2a3	g	25	.24	.48	.04	.24	.24	.32	.20	.24	.24	.32	.16	.28
TOG2a4	g	19	.21	.42	.11	.26	.21	.21	.11	.47	.21	.32	.16	.32
TOG2a4	g	19	.21	.53	.16	.11	.21	.37	.05	.37	.21	.42	.11	.26
TOG2a4	g	19	.37	.26	.00	.37	.37	.05	.21	.37	.37	.11	.00	.53
TOG2b1	g	42	.43	.26	.00	.31	.43	.14	.29	.14	.41	.19	.02	.38
TOG2b1	g	42	.52	.19	.03	.26	.53	.07	.24	.17	.50	.17	.07	.26
TOG2b1	g	42	.50	.17	.07	.26	.50	.19	.19	.12	.48	.17	.10	.26
TOG2b2	g	31	.52	.26	.07	.16	.52	.23	.10	.16	.48	.19	.10	.23
TOG2b2	g	31	.61	.16	.03	.19	.61	.13	.13	.13	.61	.10	.03	.26
TOG2b3	g	23	.09	.57	.04	.30	.09	.39	.26	.26	.13	.44	.09	.35
TOG2b3	g	23	.04	.61	.04	.30	.04	.44	.30	.22	.00	.35	.22	.44
TOG2b4	g	19	.21	.53	.00	.26	.11	.21	.42	.26	.11	.37	.00	.53
TOG2b4	g	19	.16	.68	.00	.16	.16	.32	.32	.21	.11	.47	.00	.42
TOG2b4	g	19	.42	.32	.00	.26	.42	.16	.21	.21	.37	.21	.00	.42
TOG1a1	b	81	.22	.15	.16	.47	.22	.32	.25	.21	.24	.20	.24	.33
TOG1a1	b	81	.28	.20	.17	.28	.35	.37	.07	.21	.43	.28	.15	.14
TOG1a1	b	81	.35	.16	.09	.35	.43	.21	.10	.26	.43	.20	.09	.28
TOG1a2	b	67	.37	.13	.10	.39	.37	.24	.15	.24	.37	.18	.24	.21
TOG1a2	b	67	.49	.12	.05	.34	.49	.10	.22	.18	.49	.18	.03	.30
TOG1a3	b	25	.24	.16	.20	.40	.24	.40	.12	.24	.24	.32	.28	.16
TOG1a3	b	25	.20	.20	.12	.48	.20	.32	.24	.20	.20	.32	.12	.36
TOG1a3	b	25	.24	.16	.24	.36	.24	.36	.16	.24	.24	.36	.16	.24
TOG1b1	b	11	.27	.46	.00	.27	.27	.36	.27	.09	.27	.64	.00	.09
TOG1b1	b	11	.09	.55	.00	.36	.09	.36	.27	.27	.09	.73	.00	.18
TOG1b1	b	11	.09	.46	.09	.36	.09	.46	.36	.09	.09	.73	.00	.18
TOG1b2	b	36	.42	.36	.06	.17	.42	.22	.14	.22	.42	.14	.31	.14
TOG1b2	b	36	.14	.31	.03	.53	.14	.11	.28	.47	.14	.17	.28	.42
TOG1b2	b	36	.33	.22	.03	.42	.33	.14	.22	.31	.33	.25	.11	.31

Notes: Part.Type = participant type; g = Girl pupil; b = Boy pupil; t = Female teacher. Obs. = Number of observations of an individual in the task. [a] = Proportion, calculated by taking observed count in a particular category over the task and dividing it by the total number of observations for that individual over the task, expressed as a decimal proportion. Totals across category proportions, in a variable, are subject to rounding error.
Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials. .

Table 8.01b Proportion database ('Pool' data) sorted by: TOG and TIG groups and participant type – page 2.

Task group	Part. Type	Obs. in task	*Proportion*[a] *of observations counted in each gesture category*				Proportion of observations counted in each gesture-target category				Proportion observations counted in each task-activity category			
			P	*L*	*I*	*In*	Nt	Pt	M	Pm	Na	O	S	U
TOG1b3	b	28	.61	.25	.00	.14	.61	.21	.00	.18	.61	.25	.04	.11
TOG1b3	b	28	.36	.21	.04	.39	.36	.21	.14	.29	.36	.11	.32	.21
TOG1b3	b	28	.50	.21	.00	.29	.50	.21	.04	.25	.50	.25	.14	.11
TOG2a1	b	31	.26	.42	.16	.16	.26	.29	.19	.26	.26	.19	.23	.32
TOG2a1	b	31	.55	.23	.10	.13	.55	.03	.16	.26	.55	.07	.13	.26
TOG2a1	b	31	.19	.65	.07	.10	.19	.26	.29	.26	.23	.32	.03	.42
TOG2a3	b	25	.12	.32	.24	.32	.12	.20	.28	.40	.12	.32	.32	.24
TOG2a3	b	25	.12	.32	.08	.48	.12	.32	.20	.36	.12	.32	.12	.44
TOG2a3	b	25	.12	.24	.24	.40	.12	.16	.24	.48	.16	.16	.12	.56
TOG2a4	b	19	.26	.21	.11	.42	.26	.16	.26	.32	.26	.11	.16	.47
TOG2a4	b	19	.32	.21	.26	.21	.32	.21	.05	.42	.26	.21	.16	.37
TOG2a4	b	19	.21	.32	.05	.42	.21	.11	.21	.47	.21	.26	.00	.53
TOG2b1	b	42	.50	.12	.07	.31	.50	.19	.19	.12	.50	.17	.10	.24
TOG2b1	b	42	.45	.12	.03	.41	.45	.12	.19	.24	.48	.17	.07	.29
TOG2b1	b	42	.29	.29	.07	.36	.29	.24	.26	.21	.29	.24	.02	.45
TOG2b2	b	31	.42	.32	.03	.23	.42	.10	.39	.10	.42	.16	.10	.32
TOG2b2	b	31	.45	.45	.03	.07	.45	.32	.10	.13	.42	.23	.19	.16
TOG2b2	b	31	.48	.36	.00	.16	.48	.19	.13	.19	.48	.10	.32	.10
TOG2b2	b	31	.32	.52	.03	.13	.32	.29	.19	.19	.29	.42	.13	.16
TOG2b3	b	23	.13	.57	.04	.26	.13	.44	.13	.30	.13	.52	.09	.26
TOG2b3	b	23	.00	.65	.00	.35	.00	.39	.39	.22	.04	.61	.04	.30
TOG2b3	b	23	.30	.61	.00	.09	.30	.44	.17	.09	.26	.57	.00	.17
TOG2b4	b	19	.21	.53	.00	.26	.21	.16	.37	.26	.32	.16	.00	.53
TOG2b4	b	19	.16	.58	.05	.21	.16	.47	.21	.16	.21	.32	.00	.47
TOG2b4	b	19	.21	.53	.05	.21	.21	.42	.21	.16	.16	.32	.00	.53
TOG1a1	t	81	.72	.10	.14	.04	.73	.26	.00	.01	.74	.14	.11	.01
TOG1a2	t	67	.61	.02	.06	.31	.61	.15	.03	.21	.60	.06	.27	.08
TOG1a3	t	25	.96	.00	.04	.00	.96	.04	.00	.00	.96	.00	.04	.00
TOG1b1	t	11	.73	.09	.00	.18	.73	.09	.09	.09	.73	.00	.09	.18
TOG1b2	t	36	.92	.03	.00	.06	.92	.03	.03	3.00	.92	.00	.06	.03
TOG1b3	t	28	.93	.07	.00	.00	.93	.07	.00	.00	.93	.00	.07	.00
TOG2a1	t	31	.61	.26	.00	.13	.61	.26	.03	.10	.61	.10	.26	.03
TOG2a3	t	25	1.00	.00	.00	.00	1.00	.00	.00	.00	.96	.04	.00	.00
TOG2a4	t	19	1.00	.00	.00	.00	1.00	.00	.00	.00	1.00	.00	.00	.00
TOG2b1	t	42	.81	.05	.05	.10	.81	.19	.00	.00	.76	.17	.70	.00
TOG2b2	t	31	.74	.16	.07	.03	.74	.16	.07	.03	.71	.13	.16	.00
TOG2b3	t	23	.70	.22	.00	.09	.70	.26	.00	.04	.74	.04	.22	.00
TOG2b4	t	19	.58	.15	.05	.21	.58	.32	.00	.11	.53	.21	.21	.05
TOG1a4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOG1b4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOG2a2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIG1a1	g	79	.06	.70	.23	.01	.06	.30	.35	.28	.09	.82	.08	.01
TIG1a1	g	79	.14	.58	.23	.05	.14	.30	.30	.25	.14	.68	.13	.05
TIG1a1	g	79	.17	.68	.11	.04	.17	.37	.23	.24	.19	.73	.05	.03
TIG1a1	g	79	.17	.65	.15	.04	.17	.30	.33	.20	.17	.70	.11	.03
TIG1a1	g	79	.08	.52	.38	.03	.08	.32	.23	.38	.08	.76	.14	.03
TIG1a1	g	79	.13	.58	.19	.10	.13	.33	.27	.28	.15	.72	.03	.10
TIG1a2	g	60	.32	.38	.18	.12	.32	.25	.12	.32	.32	.48	.10	.10
TIG1a2	g	60	.25	.50	.13	.12	.25	.28	.20	.27	.27	.45	.18	.10

Notes: Part.Type = participant type; g = Girl pupil; b = Boy pupil; t = Female teacher. Obs. = Number of observations of an individual in the task. [a] = Proportion, calculated by taking observed count in a particular category over the task and dividing it by the total number of observations for that individual over the task, expressed as a decimal proportion. Totals across category proportions, in a variable, are subject to rounding error. '-' = No observation took place.
Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials. .

Table 8.01c Proportion database ('Pool' data) sorted by: TOG and TIG groups and participant type – page 3.

Task group	Part. Type	Obs. in task	*Proportion[a] of observations counted in each gesture category*				Proportion of observations counted in each gesture-target category				Proportion observations counted in each task-activity category			
			P	*L*	*I*	*In*	Nt	Pt	M	Pm	Na	O	S	U
TIG1a2	g	60	.40	.33	.17	.10	.40	.27	.12	.22	.40	.43	.13	.03
TIG1a2	g	60	.33	.33	.22	.12	.33	.27	.15	.25	.33	.40	.22	.05
TIG1a2	g	60	.25	.43	.17	.15	.25	.25	.18	.32	.25	.48	.15	.12
TIG1a2	g	60	.35	.50	.12	.03	.35	.27	.23	.15	.35	.58	.05	.02
TIG1a3	g	113	.28	.55	.14	.03	.28	.24	.27	.21	.29	.53	.18	.00
TIG1a3	g	113	.27	.50	.17	.05	.27	.16	.28	.28	.27	.50	.21	.02
TIG1a3	g	113	.20	.58	.17	.04	.20	.27	.28	.24	.20	.69	.09	.02
TIG1a3	g	113	.16	.64	.17	.04	.16	.23	.27	.34	.16	.66	.16	.02
TIG1a3	g	113	.16	.59	.20	.04	.16	.22	.38	.24	.16	.69	.12	.03
TIG1a3	g	113	.27	.54	.15	.04	.27	.16	.35	.22	.27	.59	.12	.02
TIG1a4	g	58	.47	.38	.09	.07	.47	.12	.22	.19	.45	.38	.14	.03
TIG1a4	g	58	.43	.45	.05	.07	.43	.17	.16	.24	.43	.35	.19	.03
TIG1a4	g	58	.43	.45	.05	.07	.43	.28	.17	.12	.41	.31	.26	.02
TIG1a4	g	58	.38	.50	.07	.05	.38	.26	.14	.22	.38	.35	.26	.02
TIG1a4	g	58	.36	.41	.12	.10	.36	.21	.17	.26	.36	.41	.17	.05
TIG1a4	g	58	.38	.47	.07	.09	.38	.17	.17	.28	.38	.40	.17	.05
TIG1b1	g	68	.28	.50	.02	.21	.28	.24	.19	.29	.28	.43	.15	.15
TIG1b1	g	68	.13	.37	.19	.31	.13	.24	.21	.43	.15	.47	.19	.19
TIG1b4	g	55	.29	.60	.07	.04	.29	.33	.24	.15	.29	.60	.07	.04
TIG1b4	g	55	.18	.53	.16	.13	.18	.40	.20	.22	.18	.51	.22	.09
TIG2a1	g	85	.24	.49	.13	.14	.24	.37	.18	.22	.22	.53	.11	.14
TIG2a1	g	85	.18	.55	.15	.12	.18	.34	.37	.12	.17	.60	.05	.20
TIG2a2	g	79	.28	.32	.17	.24	.28	.27	.17	.29	.28	.32	.25	.15
TIG2a2	g	79	.38	.43	.10	.09	.38	.38	.13	.11	.39	.32	.18	.11
TIG2a3	g	69	.15	.44	.36	.06	.15	.36	.13	.36	.19	.58	.19	.04
TIG2a3	g	69	.12	.46	.38	.04	.12	.36	.24	.28	.12	.61	.25	.03
TIG2a4	g	73	.12	.59	.15	.14	.12	.37	.22	.29	.14	.62	.12	.12
TIG2a4	g	73	.10	.56	.22	.12	.10	.30	.32	.29	.12	.67	.16	.04
TIG2b1	g	92	.23	.37	.21	.20	.23	.25	.25	.27	.23	.48	.21	.09
TIG2b1	g	92	.38	.39	.11	.12	.38	.20	.26	.16	.38	.52	.03	.07
TIG2b3	g	62	.26	.55	.15	.05	.26	.27	.21	.26	.27	.55	.11	.07
TIG2b3	g	62	.18	.68	.11	.03	.18	.36	.32	.15	.19	.69	.07	.05
TIG1b1	b	68	.09	.52	.19	.21	.09	.40	.16	.35	.09	.43	.31	.18
TIG1b1	b	68	.09	.29	.31	.31	.09	.29	.07	.54	.09	.37	.28	.27
TIG1b4	b	55	.18	.51	.24	.07	.18	.38	.24	.20	.18	.56	.20	.06
TIG1b4	b	55	.33	.49	.13	.06	.33	.31	.24	.13	.33	.49	.15	.04
TIG2a1	b	85	.29	.31	.17	.24	.29	.39	.19	.13	.34	.35	.08	.22
TIG2a1	b	85	.26	.48	.11	.15	.26	.37	.22	.15	.25	.52	.04	.20
TIG2a1	b	85	.24	.46	.25	.06	.24	.31	.32	.14	.20	.54	.07	.19
TIG2a1	b	85	.17	.46	.20	.18	.17	.33	.27	.24	.14	.54	.11	.21
TIG2a2	b	79	.44	.25	.18	.13	.44	.24	.17	.15	.44	.27	.20	.09
TIG2a2	b	79	.25	.34	.10	.30	.25	.27	.17	.32	.25	.34	.24	.17

Notes: Part.Type = participant type; g = Girl pupil; b = Boy pupil; t = Female teacher. Obs. = Number of observations of an individual in the task. [a] = Proportion, calculated by taking observed count in a particular category over the task and dividing it by the total number of observations for that individual over the task, expressed as a decimal proportion. Totals across category proportions, in a variable, are subject to rounding error. '-' = No observation took place.
Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials. .

Table 8.01d Proportion database ('Pool' data) sorted by: TOG and TIG groups and participant type – page 4.

Task group	Part. Type	Obs. in task	*Proportion[a] of observations counted in each gesture category*				Proportion of observations counted in each gesture-target category				Proportion observations counted in each task-activity category			
			P	*L*	*I*	*In*	Nt	Pt	M	Pm	Na	O	S	U
TIG2a2	b	79	.39	.33	.08	.20	.39	.25	.13	.23	.41	.39	.13	.08
TIG2a3	b	69	.04	.45	.30	.20	.04	.28	.20	.48	.04	.55	.30	.10
TIG2a3	b	69	.19	.45	.29	.07	.19	.42	.20	.19	.20	.55	.23	.02
TIG2a4	b	73	.10	.48	.33	.10	.10	.25	.23	.43	.10	.56	.30	.04
TIG2a4	b	73	.07	.70	.15	.08	.07	.29	.40	.25	.07	.74	.10	.10
TIG2a4	b	73	.18	.48	.19	.15	.18	.26	.29	.27	.18	.59	.16	.07
TIG2b1	b	92	.29	.36	.14	.21	.29	.17	.23	.30	.29	.50	.20	.01
TIG2b1	b	92	.32	.45	.13	.11	.32	.21	.30	.17	.32	.59	.02	.08
TIG2b1	b	92	.21	.38	.10	.32	.21	.34	.17	.28	.21	.35	.37	.08
TIG2b3	b	62	.05	.45	.34	.16	.05	.31	.18	.47	.11	.45	.24	.19
TIG2b3	b	62	.10	.53	.32	.05	.10	.31	.23	.37	.11	.65	.13	.11
TIG2b3	b	62	.07	.55	.26	.13	.07	.37	.32	.24	.07	.55	.19	.19
TIG1a1	t	79	.13	.72	.05	.10	.13	.57	.06	.24	.14	.14	.68	.04
TIG1a2	t	60	.22	.70	.00	.08	.22	.63	.02	.13	.25	.03	.72	.00
TIG1a3	t	113	.24	.70	.06	.00	.24	.65	.03	.09	.24	.19	.58	.00
TIG1a4	t	58	.16	.74	.07	.03	.16	.69	.00	.16	.16	.12	.71	.02
TIG1b1	t	68	.21	.68	.02	.10	.21	.54	.06	.19	.19	.13	.66	.02
TIG1b4	t	55	.02	.84	.15	.00	.02	.78	.06	.15	.02	.15	.84	.00
TIG2a1	t	85	.38	.31	.12	.20	.38	.40	.05	.18	.37	.20	.34	.10
TIG2a2	t	79	.23	.54	.06	.17	.23	.54	.06	.17	.23	.10	.62	.05
TIG2a3	t	69	.13	.67	.13	.07	.13	.73	.01	.13	.13	.12	.74	.02
TIG2a4	t	73	.11	.69	.07	.14	.11	.51	.06	.33	.12	.04	.75	.08
TIG2b1	t	92	.12	.75	.03	.10	.12	.57	.08	.24	.12	.09	.78	.01
TIG2b3	t	62	.10	.65	.08	.18	.10	.50	.07	.34	.11	.11	.73	.05
TIG1b2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIG1b3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIG2b2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIG2b4	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: Part.Type = participant type; g = Girl pupil; b = Boy pupil; t = Female teacher. Obs. = Number of observations of an individual in the task. [a] = Proportion, calculated by taking observed count in a particular category over the task and dividing it by the total number of observations for that individual over the task, expressed as a decimal proportion. Totals across category proportions, in a variable, are subject to rounding error. '-' = No observation took place.
Gesture categories: P = Presence; L = Looking-on; I = Indicative; In = Intermediary.
Gesture-targeting categories: Nt = No-targeting; Pt = Targeting-to-People; M = Targeting-to-Materials; Pm = Targeting-to-People-and-materials.
Task-activity categories: Na = No-activity; O = Observing; S = Speaking; U = Using-materials. .

Table 8.02 Summary of means of participating groups and test of homogeneity for 1-way, between-groups ANOVA test on 'Pool' data.

	Groups for ANOVA									Test of Homogeneity of Variances			
	Girls			Boys			Teachers						
1-way, between-groups ANOVA	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation	Levine statistic	df1	df2	Sig.
TOG													
Presence	35	0.3140	0.14221	39	0.2879	0.14600	13	0.7831	0.16240	0.478	2	84	0.622
Looking-on	35	0.3069	0.17583	39	0.3303	0.16605	13	0.0885	0.08620	5.027	2	84	**0.009**
Indicative	35	0.0586	0.05018	39	0.0908	0.10165	13	0.0315	0.04259	4.556	2	84	**0.013**
Intermediary	35	0.3280	0.12017	39	0.2923	0.12064	13	0.1308	0.16780	0.360	2	84	0.699
No-targeting	35	0.3166	0.15061	39	0.2928	0.14709	13	0.7938	0.15289	0.077	2	84	0.926
Targeting-to-People	35	0.2383	0.10980	39	0.2592	0.11593	13	0.1408	0.11079	0.069	2	84	0.933
Targeting-to-Materials	35	0.1980	0.10510	39	0.2010	0.09273	13	0.0192	0.03013	6.966	2	84	**0.002**
Targeting-People-and-Materials	35	0.2471	0.08587	39	0.2449	0.10247	13	0.2762	0.82085	9.295	2	84	**<0.0005**
No-Activity	35	0.3109	0.14736	39	0.2979	0.14417	13	0.7838	0.15543	0.105	2	84	0.901
Observing	35	0.2686	0.12248	39	0.2887	0.17059	13	0.0685	0.0381	2.859	2	84	0.063
Speaking	35	0.1051	0.10033	39	0.1241	0.10490	13	0.1685	0.18484	2.030	2	84	0.138
Using-materials	35	0.3171	0.10286	39	0.2913	0.13621	13	0.0292	0.05171	7.714	2	84	**0.002**
TIG													
Presence	40	0.2485	0.10869	22	0.2345	0.18626	12	0.1708	0.09219	1.647	2	71	0.200
Looking-on	40	0.4943	0.10561	22	0.4418	0.10121	12	0.6658	0.13201	0.137	2	71	0.872
Indicative	40	0.1603	0.08018	22	0.2050	0.08399	12	0.0700	0.04492	2.536	2	71	0.086
Intermediary	40	0.0910	0.06456	22	0.1532	0.07649	12	0.0975	0.06676	0.622	2	71	0.540
No-targeting	40	0.2485	0.10869	22	0.1977	0.11481	12	0.1708	0.09219	0.708	2	71	0.496
Targeting-to-People	40	0.2760	0.06861	22	0.3068	0.06447	12	0.5925	0.10754	2.979	2	71	0.057
Targeting-to-Materials	40	0.2303	0.07174	22	0.2241	0.07301	12	0.0467	0.02535	4.185	2	71	**0.019**
Targeting-People-and-Materials	40	0.2472	0.07071	22	0.2741	0.12192	12	0.1958	0.07798	4.893	2	71	**0.011**
No-Activity	40	0.2525	0.10273	22	0.2009	0.11547	12	0.1733	0.08988	0.783	2	71	0.461
Observing	40	0.5397	0.13571	22	0.4945	0.11421	12	0.1183	0.05096	6.638	2	71	**0.002**
Speaking	40	0.1450	0.06401	22	0.1841	0.09445	12	0.6792	0.12745	2.722	2	71	0.073
Using-materials	40	0.0640	0.05093	22	0.1227	0.07408	12	0.0325	0.03251	8.407	2	71	**0.001**

Note: Significance figures in bold indicate a failure of homogeneity of variances.

Table 8.03 Results of *post hoc* tests for 1-way, between-groups, ANOVA: 'Pool' data: Participants-TOG gestures) .

Gesture	Participant type 1st	2nd	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	Upper Bound
Presence	g (35)	b (39)	0.02503	0.842	-0.0573	0.1074
	g (35)	t (13)	-0.47908	**<0.0005*** ** t > g	-0.5939	-0.3642
	b (39)	T (13)	-0.50410	**<0.0005*** ** t > b	-0.6174	-0.3908
Looking-on	g	b	-0.02340	0.898	-0.1149	0.0681
	g	t	0.21840	***<0.0005**** g > t	0.0908	0.3460
	b	t	0.24179	***<0.0005**** b > t	0.1160	0.3676
Indicative	g	b	-0.02066	0.405	-0.0561	0.0148
	g	t	0.02703	0.460	-0.0225	0.0765
	b	t	0.04769	0.057	-0.0011	0.0965
Intermediary	g	b	0.01797	0.877	-0.0474	0.0833
	g	t	0.22925	**<0.0005*** ** g > t	0.1381	0.3204
	b	t	0.21128	**<0.0005*** ** b > t	0.1214	0.3012

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = exact *p* values used where available, star categories: $p < 0.05$ = *, $p < 0.01$ = **, $p < 0.001$***. The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate that the related ANOVA failed Levene's test. All tests: Hochberg's GT2 test unless otherwise indicated (Results showed same level of significance in Games-Howells procedure for unequal variance).

Table 8.04 Results of *post hoc* tests for 1-way, between-groups, ANOVA: 'Pool' data: Participants-TOG Gesture-Targeting.

Gesture	Participant type 1st	2nd	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	Upper Bound
No-targeting	g (35)	b (39)	0.02375	0.871	-0.0609	0.1084
	g (35)	t (13)	-0.47727	**<0.0005*** ** t > g	-0.5954	-0.3592
	b (39)	T (13)	-0.50103	**<0.0005*** ** t > b	-0.6175	-0.3846
People	g	b	-0.02095	0.810	-0.0849	0.0430
	g	t	0.09752	**0.028*** g > t	0.0084	0.1867
	b	t	0.11846	**0.005**** b > t	0.0306	0.2064
Materials	g	b	-0.00300	0.999	-0.0553	0.0492
	g	t	0.17877	***<0.0005**** g > t	0.1059	0.2516
	b	t	0.18179	***<0.0005**** b > t	0.1100	0.2536
People and Materials	g	b	0.00227	1.000	-0.1805	0.1851
	g	t	-0.02901	0.990	-0.2840	0.2260
	b	t	0.03128	0.986	-0.2827	0.2201

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = exact *p* values used where available, star categories: $p < 0.05$ = *, $p < 0.01$ = **, $p < 0.001$***. The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate the related ANOVA failed Levene's test. All tests: Hochberg's GT2 test unless otherwise indicated (Results showed same level of significance in Games-Howells procedure for unequal variance).

Table 8.05 Results of *post hoc* tests for 1-way, between-groups, ANOVA: 'Pool' data: Participants-TOG Task-Activity.

Gesture	Participant type 1st	2nd	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	Upper Bound
No-activity	g (35)	b (39)	0.01291	0.974	-0.0705	0.0963
	g (35)	t (13)	-0.47299	**<0.0005*** ** t > g	-0.5893	-0.3567
	b (39)	t (13)	-0.48590	**<0.0005*** ** t > b	-0.6006	-0.3712
Observing	g	b	-0.02015	0.903	-0.1003	0.0600
	g	t	0.20011	**<0.0005*** ** g > t	0.0882	0.3120
	b	t	0.22026	**<0.0005*** ** b > t	0.1100	0.3306
Speaking	g	b	-0.01896	0.867	-0.0859	0.0479
	g	t	-0.06332	0.275	0.1567	0.0300
	b	t	-0.04436	0.565	0.1364	0.0477
Using - materials	g	b	0.02586	0.702	-0.0389	0.0906
	g	t	0.29791	***<0.0005**** g > t	0.1976	0.3783
	b	t	0.26205	***<0.0005**** b > t	0.1730	0.3511

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = exact *p* values used where available, star categories: $p < 0.05$ = *, $p < 0.01$ = **, $p < 0.001$***. The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate the related ANOVA failed Levene's test. All tests: Hochberg's GT2 test unless otherwise indicated (Results showed same level of significance in Games-Howells procedure for unequal variance).

Table 8.06 Results of *post hoc* tests for 1-way, between-groups, ANOVA: 'Pool' data: Participants-TIG gestures.

Gesture	Participant type 1st	2nd	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	Upper Bound
Presence	g (35)	b (39)	0.04077	0.223	-0.0194	0.1209
	g (35)	t (13)	0.07767	0.094	-0.0093	0.1647
	b (39)	t (13)	0.02689	0.866	-0.0608	0.1218
Looking-on	g	b	0.05993	0.108	-0.0092	0.1291
	g	t	-0.16408	**<0.0005*** ** t > g	-0.2498	-0.0784
	b	t	-0.22402	**<0.0005*** ** t > b	-0.3175	-0.1305
Indicative	g	b	-0.04475	0.092	-0.0947	0.0052
	g	t	0.09025	**0.002** ** g > t	0.0283	0.1522
	b	t	0.13500	**<0.0005*** ** b > t	0.0675	0.2025
Intermediary	g	b	-0.06764	**0.002** ** b > g	-0.1136	-0.0216
	g	t	-0.00650	0.989	-0.0635	0.0505
	b	t	0.06114	0.055	-0.0010	0.1233

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = exact *p* values used where available, star categories: $p < 0.05$ = *, $p < 0.01$ = **, $p < 0.001$***. The balance of means is given using participant categories, largest mean first. All tests: Hochberg's GT2 test unless otherwise indicated (Results showed same level of significance in Games-Howells procedure for unequal variance).

Table 8.07 Results of *post hoc* tests for 1-way, between-groups, ANOVA: 'Pool' data: Participants-TIG Gesture-Targeting.

Gesture	Participant type 1st	2nd	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	Upper Bound
No-targeting	g (35)	b (39)	0.05077	0.223	-0.0194	0.1209
	g (35)	t (13)	0.07767	0.094	-0.0093	0.1647
	b (39)	T (13)	0.02689	0.866	-0.0680	0.1218
People	g	b	-0.03082	0.328	-0.0794	0.0177
	g	t	-0.31650	**<0.0005*** ** t > g	-0.3767	-0.2563
	b	t	-0.28568	**<0.0005*** ** t > b	-0.3513	-0.2200
Materials	g	b	0.00616	0.980	-0.0374	0.0497
	g	t	0.18358	***<0.0005**** g > t	0.1296	0.2375
	b	t	0.17742	***<0.0005**** b > t	0.1186	0.2363
People and Materials	g	b	0.02684	0.599	-0.0852	0.0315
	g	t	-0.05142	0.236	-0.0209	0.1237
	b	t	0.07826	0.052	-0.0006	0.1571

Note: Participant categories: g=girls; b=boys; t=teacher. [a] = exact *p* values used where available, star categories: $p < 0.05$ = *, $p < 0.01$ = **, $p < 0.001$***. The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate the related ANOVA failed Levene's test. All tests: Hochberg's GT2 test unless otherwise indicated (Results showed same level of significance in Games-Howells procedure for unequal variance).

Table 8.08 Results of *post hoc* tests for 1-way, between-groups, ANOVA: 'Pool' data: Participants-TIG Task-Activity.

Gesture	Participant type 1st	2nd	Mean Diff.	Sig [a]	95% Confidence Interval Lower Bound	Upper Bound
No-activity	g (35)	b (39)	0.05159	0.189	-0.0164	0.1196
	g (35)	t (13)	0.07917	0.072	-0.0051	0.1635
	b (39)	t (13)	0.02758	0.845	-0.0643	0.1195
Observing	g	b	0.04520	0.404	-0.0326	0.1230
	g	t	0.42142	***<0.0005**** g > t	0.3250	0.5178
	b	t	0.37621	***<0.0005**** b > t	0.2711	0.4813
Speaking	g	b	-0.03909	0.248	-0.0949	0.0167
	g	t	-0.53417	**<0.0005*** t > g	-0.6034	-0.4650
	b	t	-0.49508	**<0.0005*** t > b	-0.5705	-0.4196
Using - materials	g	b	-0.05873	***0.001**** b > g	-0.0955	-0.0220
	g	t	0.03150	0.258	-0.0141	0.0771
	b	t	0.09023	***<0.0005**** b > t	0.0405	0.1399

Note: Participant categories: g=girls; b=boys; t=teacher [a] = exact *p* values used where available, star categories: $p < 0.05$ = *, $p < 0.01$ = **, $p < 0.001$***The balance of means is given using participant categories, largest mean first. Significance results in italic type indicate the related ANOVA failed Levene's test. All tests: Hochberg's GT2 test unless otherwise indicated (Results showed same level of significance in Games-Howells procedure for unequal variance, **except** for Using-materials g v t: mean diff. = 0.03150, p = 0.042*, 95% Conf. Int. LB, 0.0009, UB,0.0621).

Table 8.09 Summary of Kruskal-Wallis test results on 'Pool' data in TOG and TIG groups

	Groups for Kruskal-Wallis test						Kruskal-Wallis test[a]		
	Girls		Boys		Teachers				
Kruskal-Wallis 3-Independent groups	N	Mean Rank	N	Mean Rank	N	Mean Rank	Chi-Square	df	Sig.
TOG									
Presence	35	39.54	39	35.78	13	80.65	32.639	2	**<0.0005*** **
Looking-on	35	47.20	39	50.95	13	14.54	21.225	2	**<0.0005*** **
Indicative	35	43.93	39	48.38	13	31.04	4.716	2	0.095
Intermediary	35	50.76	39	48.32	13	12.85	23.481	2	**<0.0005*** **
No-targeting	35	39.27	39	36.05	13	80.58	32.386	2	**<0.0005*** **
Targeting-to-People	35	44.86	39	49.31	13	25.77	8.574	2	**0.014***
Targeting-to-Materials	35	49.51	39	50.77	13	8.85	29.717	2	**<0.0005*** **
Targeting-People-and-Materials	35	49.83	39	48.29	13	15.42	19.681	2	**<0.0005*** **
No-Activity	35	38.56	39	36.76	13	80.38	31.384	2	**<0.0005*** **
Observing	35	49.44	39	49.72	13	12.19	24.307	2	**<0.0005*** **
Speaking	35	40.53	39	45.47	13	48.92	1.300	2	0.522
Using-materials	35	53.17	39	47.74	13	8.08	31.834	2	**<0.0005*** **
TIG									
Presence	40	42.79	22	33.23	12	27.71	5.782	2	0.056
Looking-on	40	36.81	22	26.05	12	60.79	20.390	2	**<0.0005*** **
Indicative	40	38.51	22	48.66	12	48.66	20.810	2	**<0.0005*** **
Intermediary	40	31.18	22	50.45	12	50.45	11.677	2	**0.003****
No-targeting	40	42.79	22	33.23	12	27.71	5.782	2	0.056
Targeting-to-People	40	28.59	22	36.89	12	68.33	31.627	2	**<0.0005*** **
Targeting-to-Materials	40	43.89	22	42.73	12	6.63	29.637	2	**<0.0005*** **
Targeting-People-and-Materials	40	39.25	22	40.95	12	25.33	4.688	2	0.096
No-Activity	40	43.28	22	32.45	12	27.50	6.698	2	**0.035***
Observing	40	45.48	22	39.91	12	6.50	30.732	2	**<0.0005*** **
Speaking	40	28.78	22	36.50	12	68.42	31.464	2	**<0.0005*** **
Using-materials	40	34.78	22	51.41	12	21.08	16.957	2	**<0.0005*** **

Note: [a] = Kruskal-Wallis test results reported as suggested by Field& Hole (2003) p 249. Effect sizes are reported for the associated Mann-Witney test results in Table 8.11 et seq, also as suggested by Field & Hole, (2003) ibid. Sig. = actual values given and rated according to: * = <0.05; ** = <0.01; *** = < 0.001.

Table 8.10 Results for Mann-Witney tests following Kruskal-Wallis Test on 'Pool' data: TOG participants – Gestures (Bonferroni correction applied).

	Participants		Mann-Witney test			Effect size[b]
Gesture	1st	2nd		2-tailed sig[a]	Direction of balance of mean ranks	*r*
Presence	g (35)	b (39)	613.500	0.455	g = b (39.47 = 35.73)	-
	g (35)	t (13)	2.500	**<0.003****	t > g (41.81 > 18.07)	-0.75
	b (39)	t (13)	2.000	**<0.003****	t > b (45.85 > 20.05)	-0.74
Looking-on	g	b	621.500	0.509	g = b (35.76 = 39.06)	-
	g	t	54.500	**<0.003****	g > t (29.44 > 11.19)	-0.58
	b	t	43.500	**<0.003****	b > t (31.88 > 10.35)	-0.62
Indicative	g	b	612.000	0.441	g = b (35.49 = 39.31)	-
	g	t	159.500	0.107	g = t (26.44 = 19.27)	-
	b	t	43.500	0.031	b = t (29.08 = 18.77)	-
Intermediary	g	b	643.500	0.672	g = b (38.61 = 36.50)	-
	g	t	30.000	**<0.003****	g > t (30.14 > 9.31)	-0.66
	b	t	46.000	**<0.003****	b > t (31.82 > 10.54)	-0.61

Note: sig[a] = As 3 tests were made on the same data, Bonferroni correction was applied: for an α of 0.05, significance was 0.05/3 = <0.02*; for an α of 0.01, significance was 0.01/3 = <0.003**. Values shown as significant are **after** correction has been applied. [b] = Effect size '*r*' calculated using *z* values as described in Field & Hole (2003) p248-249.

Table 8.11 Results for Mann-Witney tests following Kruskal-Wallis Test on 'Pool' data: TOG participants – Gestures-Targets (Bonferroni correction applied).

	Participants		Mann-Witney test			Effect size[b]
Gesture-Targets	1st	2nd		2-tailed sig[a]	Direction of balance of mean ranks	*r*
No-Targeting	g (35)	b (39)	624.000	0.526	g = b (39.17 = 36.00)	-
	g (35)	t (13)	3.500	**<0.003****	t > g (41.73 > 18.10)	-0.75
	b (39)	t (13)	2.000	**<0.003****	t > b (45.85 > 20.05)	-0.74
Targeting-to-People	g	b	608.500	0.422	g = b (36.79 = 38.14)	-
	g	t	123.500	**<0.02***	g > t (27.47 > 16.50)	-0.35
	b	t	120.500	**<0.02***	b > t (29.91 > 16.27)	-0.39
Targeting-to-Materials	g	b	657.500	0.786	g = b (35.49 = 39.31)	-
	g	t	9.500	**<0.003****	g > t (30.73 > 7.73)	-0.73
	b	t	14.500	**<0.003****	b > t (32.63 > 8.12)	-0.70
Targeting-to-People-and-materials	g	b	659.000	0.799	g = b (38.17 = 36.90)	-
	g	t	47.000	**<0.003****	g > t (29.66 > 10.62)	-0.61
	b	t	62.500	**<0.003****	b > t (31.40 > 11.81)	-0.56

Note: sig[a] = As 3 tests were made on the same data, Bonferroni correction was applied: for an α of 0.05, significance was 0.05/3 = <0.02* ; for an α of 0.01, significance was 0.01/3 = <0.003**. Values shown as significant are **after** correction has been applied. [b] = Effect size '*r*' calculated using *z* values as described in Field & Hole (2003) p248-249.

Table 8.12 Results for Mann-Witney tests following Kruskal-Wallis Test on 'Pool' data: TOG participants – Task-Activity (Bonferroni correction applied).

	Participants		Mann-Witney test			Effect size[b]
Task-Activity	1st	2nd		2-tailed sig[a]	Direction of balance of mean ranks	*r*
No-Activity	g (35)	b (39)	650.000	0.725	g = b (38.43 = 36.67)	-
	g (35)	t (13)	4.500	**<0.003****	t > g (41.65 > 18.13)	-0.75
	b (39)	t (13)	3.500	**<0.003****	t > b (45.73 > 20.09)	-0.73
Observing	g	b	677.000	0.952	g = b (37.34 = 37.64)	-
	g	t	31.500	**<0.003****	g > t (30.10 > 9.42)	-0.66
	b	t	36.000	**<0.003****	b > t (31.08 > 9.77)	-0.64
Speaking	g	b	606.000	0.405	g = b (35.31 = 39.46)	-
	g	t	182.500	0.294	g = t (23.21 = 27.96)	-
	b	t	234.500	0.687	b = t (26.01 = 27.96)	-
Using-materials	g	b	586.000	0.296	g = b (40.26 = 35.03)	-
	g	t	3.000	**<0.003****	g > t (30.91 > 7.23)	-0.75
	b	t	11.000	**<0.003****	b > t (32.72 > 7.85)	-0.71

Note: sig[a] = As 3 tests were made on the same data, Bonferroni correction was applied: for an α of 0.05, significance was 0.05/3 = <0.02* ; for an α of 0.01, significance was 0.01/3 = <0.003**. Values shown as significant are **after** correction has been applied. [b] = Effect size '*r*' calculated using *z* values as described in Field & Hole (2003) p248-249.

Table 8.13 Results for Mann-Witney tests following Kruskal-Wallis Test on 'Pool' data: TIG participants – Gestures (Bonferroni correction applied).

	Participants		Mann-Witney test			Effect size[b]
Gesture	1st	2nd		2-tailed sig[a]	Direction of balance of mean ranks	*r*
Presence	g (40)	b (22)	333.000	0.115	g = b (34.17 = 26.64)	-
	g (40)	t (12)	135.500	0.023	g = t (29.11 = 17.79)	-
	b (22)	t (12)	119.000	0.639	b = t (18.09 = 16.42)	-
Looking-on	g	b	293.500	0.031	g = b (35.16 = 28.84)	-
	g	t	66.000	**<0.003****	t > g (41.00 > 22.15)	-0.53
	b	t	26.500	**<0.003****	t > b (26.29 > 12.70)	-0.65
Indicative	g	b	309.500	0.054	g = b (28.24 = 37.43)	-
	g	t	69.000	**<0.003****	g > t (30.78 > 12.25)	-0.52
	b	t	17.000	**<0.003****	b > t (22.73 > 7.92)	-0.71
Intermediary	g	b	206.500	**<0.003****	b > g (42.11 = 25.66)	-0.44
	g	t	220.500	0.671	g = t (26.01 = 28.13)	-
	b	t	80.500	0.063	b = t (19.84 = 13.21)	-

Note: sig[a] = As 3 tests were made on the same data, Bonferroni correction was applied: for an α of 0.05, significance was 0.05/3 = <0.02* ; for an α of 0.01, significance was 0.01/3 = <0.003**. Values shown as significant are **after** correction has been applied. [b] = Effect size '*r*' calculated using *z* values as described in Field & Hole (2003) p248-249.

Table 8.14 Results for Mann-Witney tests following Kruskal-Wallis Test on 'Pool' data: TIG participants – Gestures-Targets (Bonferroni correction applied).

	Participants		Mann-Witney test			Effect size[b]
Gesture-Targets	1st	2nd		2-tailed sig[a]	Direction of balance of mean ranks	*r*
No-Targeting	g (40)	b (22)	333.000	0.115	g = b (34.17 = 26.64)	-
	g (40)	t (12)	135.000	0.023	g = t (29.11 > 17.79)	-
	b (22)	t (12)	119.000	0.639	b = t (18.09 = 16.42)	-
Targeting-to-People	g	b	323.000	0.085	g = b (28.58 = 36.82)	-
	g	t	0.500	**<0.003****	t > g (46.46 > 20.51)	-0.72
	b	t	1.500	**<0.003****	t > b (28.38 > 11.57)	-0.81
Targeting-to-Materials	g	b	424.500	0.819	g = b (31.89 = 30.80)	-
	g	t	0.000	**<0.003****	g > t (32.50 > 6.50)	-0.73
	b	t	1.500	**<0.003****	b > t (23.43 > 6.63)	-0.81
Targeting-to-People-and-materials	g	b	415.000	0.713	g = b (30.88 = 32.64)	-
	g	t	145.000	0.039	g = t (28.88 = 18.58)	-
	b	t	81.000	0.066	b = t (19.82 = 13.25)	-

Note: sig[a] = As 3 tests were made on the same data, Bonferroni correction was applied: for an α of 0.05, significance was 0.05/3 = <0.02; for an α of 0.01, significance was 0.01/3 = <0.003. Values shown as significant are **after** correction has been applied. [b] = Effect size '*r*' calculated using *z* values as described in Field & Hole (2003) p248-249.

Table 8.15 Results for Mann-Witney tests following Kruskal-Wallis Test on 'Pool' data: TIG participants – Task-Activity (Bonferroni correction applied).

	Participants		Mann-Witney test			Effect size[b]
Task-Activity	1st	2nd		2-tailed sig[a]	Direction of balance of mean ranks	*r*
No-Activity	g (40)	b (22)	319.500	0.7076	g = b (34.51 = 26.02)	-
	g (40)	t (12)	129.500	**<0.02***	g > t (29.26 > 17.29)	-0.33
	b (22)	t (12)	122.500	0.732	b = t (17.93 = 16.71)	-
Observing	g	b	361.000	0.245	g = b (33.48 = 27.91)	-
	g	t	0.000	**<0.003****	g > t (32.50 > 6.50)	-0.72
	b	t	0.000	**<0.003****	b > t (23.50 > 6.50)	-0.82
Speaking	g	b	331.00	0.108	g = b (28.78 = 36.45)	-
	g	t	0.000	**<0.003****	t > g (46.50 > 20.50)	-0.72
	b	t	1.000	**<0.003****	t > b (28.42 > 11.55)	-0.81
Using-materials	g	b	231.500	**<0.003****	b > g (40.98 > 26.29)	-0.39
	g	t	140.500	0.029	g = t (28.99 = 18.21)	-
	b	t	34.500	**<0.003****	b > t (21.93 > 9.38)	-0.61

Note: sig[a] = As 3 tests were made on the same data, Bonferroni correction was applied: for an α of 0.05, significance was 0.05/3 = <0.02; for an α of 0.01, significance was 0.01/3 = <0.003. Values shown as significant are **after** correction has been applied. [b] = Effect size '*r*' calculated using *z* values as described in Field & Hole (2003) p248-249.